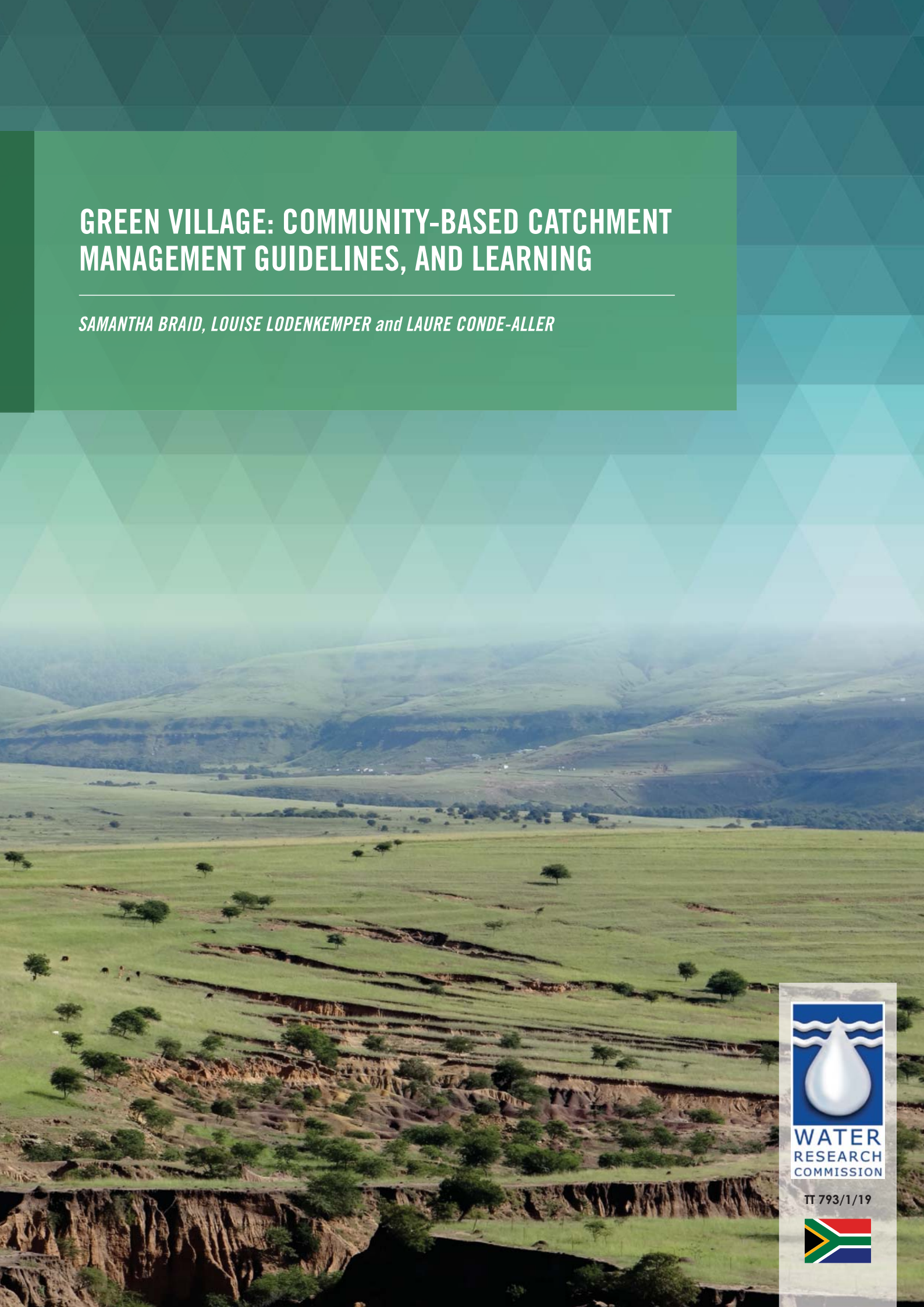
GREEN VILLAGE: COMMUNITY-BASED CATCHMENT MANAGEMENT GUIDELINES, AND LEARNING

SAMANTHA BRAID, LOUISE LODENKEMPER and LAURE CONDE-ALLER



WATER RESEARCH COMMISSION

TT 793/1/19

GREEN VILLAGE: COMMUNITY-BASED CATCHMENT MANAGEMENT GUIDELINES, AND LEARNING

Report to the

WATER RESEARCH COMMISSION

by

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Green Village: Community-based Catchment Management Guidelines (WRC Report No. TT 793/2/19)
Teaching Water & Catchments Social Sciences Grades 7-9 (WRC Report No. TT 793/3/19)

This project was conducted in parallel with WRC project K5/2423: Improving socio-economic conditions of the Tsitsa river catchment and Okhombe communities through landscape greening and integrated green innovations.

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EXECUTIVE SUMMARY

1. Introduction

Economic growth and development depend largely on water quality and availability, which are affected by competing demands between people, industry, food security, the environment, and development; all of which impact on the land and land use, which in turn impacts on the quality and availability of water. “Most rural communities do not see the land as a (major) source of livelihood. Natural resources have lost much of the driving value they might once have held, and which they still hold in other less industrialised and commoditised African countries” (Dr Ben Cousins, pers. comm). It is difficult for poverty-stricken people to feel motivated to improve their land-care practices when the effort brings few perceived immediate benefits. Further, the argument of downstream impacts is irrelevant at this level. Communities need other incentives to improve Catchment Management (CM) and general Natural Resources Management (NRM) practices and reduce impacts to their own and downstream environments.

Ntabelanga Catchment in the Eastern Cape, is a good example of this catchment dynamic. Falling within a former homeland area it is historically poorer; sections of the catchment are ripe for economic development. This development, whether urbanisation, agricultural or industrial, requires adequate and reliable water supply and water quality and electricity. However, due to excessive erosion in the upper catchment areas resulting in excessive sediment loads downstream in the main rivers, makes investment in the necessary water infrastructure (e.g. water storage, irrigation schemes, and hydropower) unfeasible as the cost of maintenance to manage the siltation of the infrastructure is too expensive. At the same time, the communities that would benefit from these economic developments are left to rely on the natural resources of the catchment for their livelihoods, which in turn contributes to the further degradation of the catchment.

Water resources degradation and land degradation are interlinked. In order to improve the state of water resources, one needs to improve the state of land resources and land use activities. According to the International Fund for Agricultural Development, by 2011 about 1.2 billion hectares (ha) of land had been degraded by various human activities over the preceding 45 years; and an estimated 5 million to 12 million ha are lost annually to severe degradation in developing countries. The causes of this degradation include deforestation, biomass burning and agricultural practices such as repetitive tillage and inadequate application of nutrients as well as not addressing (rehabilitating or mitigating) erosion issues when they start. Land degradation results in loss of soil fertility and increased soil erosion, resulting in loss of arable land. Eroded land is unproductive and results in the physical loss of land for any land use; and the eroded soils result in the siltation and contamination of water resources, thereby impacting the usability of the water resource, e.g. Ntabelanga catchment.

Erosion control and rehabilitation, and sediment management in an agricultural catchment with mainly resource poor farmers, needs to focus on sustainable and resilient rural livelihoods, increased yields and farm profitability by addressing causes of and reasons for erosion (treating the “causes” of erosion). Physical and engineered measures can then be implemented when and where erosion is still a problem or requires extensive rehabilitation (treating the “symptoms” of erosion). The need for Water Resources Management (WRM) is also critical to sustain rural household livelihoods and the basis of a green village and a green economy. Currently natural resources management in these rural areas relies on the strength of traditional and cultural institutional structures – the competency and interest of which varies from chiefdom to chiefdom. Integrated Water Resource Management has become a well-accepted concept in South Africa but is actualised primarily at the level of the primary catchment or Water Management Area and not at the rural homestead or village level (Quinary catchment scale).

Integrated resources management approaches include integrated catchment management and are characterised by a proactive, all-inclusive and systems-based approach to natural resource management challenges. It is a means of safeguarding the natural resource base, improving agricultural productivity and sustaining livelihoods. The integrated approach moves away from managing resources and specific ecosystems in isolation of each other, but rather brings the management of their utilisation and rehabilitation together in a coordinated and collaborative approach. For example, addressing siltation of rivers requires improved management of land-based activities and can't be addressed solely in terms of water resources or aquatic ecosystems management alone. The aim of community-based catchment management, the focus of this project, is not only to protect and restore the natural resources, but by doing so also provide sustainable and resilient livelihoods so that the integrity of the communities that depend on the resources through farming, livestock, fishing, forestry and other activities are not detrimentally threatened by disasters, degradation or other risks, and thereby stimulating the Green Village and Green Economy concepts.

2. Aim and Objectives

The aim of the project is to contextualise the rural household within the catchment, and help build the relationship between the household, the village, the community and the broader catchment, i.e. to build a Green Village literally from the roots up. The specific objectives of the project are:

To improve water-energy-food security as well as environmental health in rural catchments.

To empower and upskill rural communities to support their own green villages (incl. service delivery).

To improve the state of rural catchments from the individual – > household – > village outwards.

To develop an education and skills development programme to support knowledge transfer.

To develop an education and skills development programme to support rural job creation to support green villages.

This volume (Volume 1) presents the overall findings of the Project. Volume 2 presents the Community-based Catchment Management Guidelines. A third volume (Volume 3) includes the revised secondary school social science curriculum for grades 7 to 9.

3. Summary of Volume 1: Project Summary

A dependency on natural resources leads to degradation and depletion under the pressures of high population growth, historic-political, socio-economic issues and biophysical aspects. In some cases, these aspects are interconnected and share a cause/response relationship. There needs to be a shift in thinking from how the catchment affects the household, to rather how the household affects the catchment. The aim of the project set out a framework to identify what the obstacles are to sustainable natural resources management initiatives, and to develop materials and knowledge sharing as materials to support this change in thinking. The project undertook several different tasks in achieving its aim and objectives.

CHAPTER 1

This chapter introduces the project: its scope, location and objectives the project set out to achieve.

CHAPTER 2

Chapter 2 describes the Roadmap Framework which was the result of an Expert dialogue. Catchment management is not just about managing the water resource, but also the land use-, natural resource management-, land tenure- and customary law nexus. The expert dialogue aimed to bring together various specialists from water resources management, social sciences and government to engage in dialogue around catchment management at the village and community level, especially in the absence of water management institutions that accommodate the nexus.

Keys issues identified from the expert dialogue, include:

1. Issues of land tenure – not only in terms of security for livelihoods, but also in terms of responsibility for rehabilitation of historically degraded lands. These are nested in the issues of land reform and land administration, i.e. where does decision making in terms of the different elements of NRM take place? This is discussed further in Appendix A.
2. The complex and burdensome myriad of legislation limiting rehabilitation, whether community driven or government driven.
3. Adult education: Long term sustainability will occur through educating school children; whilst short term action will occur through educating the adult community. Although originally aimed at Adult education, as a result of the dialogue the education component of the project focused rather on school-based education.
4. Age gap: The population of the area has a notable lack of able-bodied individuals as most young people move to urban centres to find work. This means that there is a high occurrence of elderly and very young people, which results in a low availability of local labour available to work on land management systems.

CHAPTER 3

Chapter 3 describes the Lessons Learnt from a review of previous projects, guidelines and NRM policy. The Lessons Learnt Framework was developed from a literature review of the many natural resource management-based projects that have been implemented across the country, and some international examples. There are a variety of factors which have contributed to the success or failure of each of these projects. These factors were integrated into a framework for reviewing the projects locally, nationally and internationally which have focused on natural resource management.

The purpose of the Framework was to review the available literature on natural resource management-based projects. The following are outcomes of this framework:

- Identify National Legislation and policy administering Natural Resources Management (NRM).
- Develop a database of NRM-based projects locally, nationally and internationally.
- Determine the success or failure, including reasons, and whether the project was driven by the community or through external parties.

The literature was grouped into seven key management strategies, which are grouped into three themes as follows:

1. Policy
2. Management strategies
    2.1. Community-based management
    2.2. Land-based management
    2.3. Biodiversity-based management
    2.4. Climate Change Adaption / Preparedness
    2.5. Integrated management
3. Guidelines

The various policies, management strategies and guidelines were reviewed according to the template agreed at the Experts dialogue.

Findings included:

1. There are three national Departments which have a mandate to manage South Africa's natural resources. These Departments have a different focus and, in turn, different management strategies when it comes to Natural Resources Management, which results in isolated rather than integrated approaches. DAFF has a focus on land, within the interests of the public for agriculture and forestry productivity; DWS has a focus on water resources, which demands an integrated approach; and DEA has a focus on the environment, which encompasses people as a part of the environment.
2. Limited capacity and financial resources have meant that most departments have to be strategic with what they actually do on the ground, with many responsibilities being delegated to lower levels of government. In the case of DAFF managing indigenous forestry this has meant that the focus has been on policing natural resources, as opposed to promoting sustainable use for improving livelihoods or poverty alleviation.
3. Lack of ownership of natural resource management, with many overlaps in different Departments. It seems that the actual "on the ground" projects are usually implemented through the "research" branch of the national Departments, and the success of a project usually depends on the level of community participation and external partners included. It is apparent that whilst policy may inform natural resource management, it is the innovative solutions and community relations which sustain and make a project a success.
4. The key programmes being run by the DAFF and ARC are focused on Soil and Water Conservation, through LandCare, and Sustainable Agriculture, through the promotion of Conservation Agriculture. Although these programmes have been successful in other countries, implementation in South Africa has been slow and challenging. Key lessons learnt are the importance of developing ownership and responsibility for the strategy by landowners and communities, without this the project will not be sustainable. The top-down or employment opportunities approach is also not effective as this does not promote long-term sustainability. Introducing new concepts requires a significant amount of research and engagement, as well as pilot projects and demonstration plots in order to formulate the "best-fit" for every situation. This may require high levels of external training and capacity building initially.

There are many guidelines and tools available in South Africa for natural resource management and catchment management, but these are scattered across different sectors and are mainly directed at implementers. There are far fewer "how to" guidelines, which individuals with limited education can understand and implement themselves. Guidelines which have been useful are well formulated and simple, with a significant emphasis on shared stories and illustrations.

CHAPTER 4

One of the primary aims of this project was to compile a set of technical guidelines for rural communities, a comprehensive “How to” reference document that would enable communities to identify solutions and applicable techniques that they could implement without expensive consultants or external driven projects. The idea was not to reinvent the wheel but to draw on existing guidelines, both local to South African and other rural areas of Southern Africa, and consolidate them into one Guideline document that addressed different resource management issues and challenges in order build resilient livelihoods as the foundation for Green Villages. The first task involved collecting and reviewing existing guidelines. The second task was to structure and compile the Community-Based Catchment Management Guidelines, and fill in any gaps that were identified.

The toolbox includes guidelines for management, conservation, rehabilitation and maintenance of natural capital in order to achieve resource sustainability.

The Guideline document includes a theoretical component, a technical toolbox, and supporting documents. The theoretical component explains the need for integrated resources management in order to achieve resilient livelihoods, the legislative framework in South Africa, the theory of catchment management, and how to compile a village-level catchment management plan. The technical toolbox includes the detailed technical guidelines arranged according to the themes of:

A. Sustainable Land Management
B. Soil Fertility Management
C. Water Storage and Management
D. Natural Resources Management
E. Sustainable Households
F. Disaster Preparedness

The Annexures include detailed supporting documentation, including stakeholder participatory practices; How to establish a Green Village Committee; How to compile a budget; and Monitoring and Evaluation.

CHAPTER 5

Building capacity at community level for adaptation and sustainable livelihoods and lifestyles is also a critical challenge, particularly for those in rural areas who are most vulnerable to the impacts of social, economic and environmental risks. Currently there is a poor understanding of sustainable development in schools, and teachers have little capacity for integrating these issues into teaching and learning. In general, teachers still have inadequate environment and sustainability knowledge themselves to lay the foundation for environmental learning in schools, nevertheless, to inspire youth to take up related careers and a sense of citizenship for sustainability. The “Learning” aspect of the project was conducted through a review and updating of the secondary school social sciences curriculum for Geography, grades 7 to 9. The Project collaborated with Fundisa for Change, an education NGO, to conduct the curriculum revision and the case study.

On 12th February 2018 a group of education and subject specialists held a workshop in Grahamstown in order to draft a framework for the review of the existing Fundisa for Change Water module for the subject and phase: social sciences curriculum for Geography, grades 7 to 9. The aim of this task was to develop this resource further with additional units and activities, in order to develop teach capacity and confidence, and thereby improve teaching pedagogy of the subject. As part of the materials review process, gaps and opportunities for further development were discussed at the workshop. A detailed description of the topics proposed by the reviewing group was identified.

As a result, the revised Water Module or exemplar was adapted and additional units developed. The intention was to avoid a 'fragmented' approach from topic to topic or even from grade to grade. A logical progression was adopted for deeper understanding of the complexity pertaining to the environmental and sustainability contentious 'water and catchments' issues. The Fundisa for Change revised materials also try to assist the teacher with the planning of a learning programme with a 'progression' approach. The module was further developed during the case study (refer Chapter 6) with feedback from participating teachers and Department of Basic Education (DBE) officials. The revised Water Module is Volume 3 to this report, and is also accessible from Fundisa for Change.

CHAPTER 6

To test the revised curriculum content, a case-study approach was used and the findings analysed through a realist evaluation lens in order to illuminate the relationships or configurations between mechanisms-context-outcomes ('what works for whom in which circumstances'). The case-study involved 12 course teacher/education participants from the Tsitsa River Catchment. Contextual profiling tools, course participants Portfolio of Evidence (PoE), course evaluations, formal and informal reflections and observations were employed as main data gathering methods and tools. The data gathering tools were informed by the formal teacher professional accreditation requirements and adhered to the National Qualification Framework and Rhodes University demands. A Portfolio of Evidence (PoE) was developed to gather the necessary data to meet the accreditation requirements as well as to meet the enquiry data gathering needs for this study. Data was analysed from the teachers' PoE and from the subject advisors one. The PoE incorporated other data gathering tools such a teacher and school contextual profile, on-course assessment tasks, work-away assessment tasks, and guiding reflection questions.

The aim of the case study was twofold. On the one hand, the intention was 1: to understand to what extent the intended outcomes of the course have been met, and on the other hand, to search for more depth and insight in understanding; and 2: how the outcomes of the course, through a teachers' education and training intervention, have been shaped by the context in which the initiate was undertaken. The case study was interested in understanding the role that an environmental education and training intervention plays on the improvement of teachers' practice from the Geography subject in teaching water, catchments and sustainability. The study recognised that in order to understand how teachers' practices change and improve (or not) it required an in-depth and explanatory description of the complex social phenomena in real life context. The unit of analysis of this case-study encompassed the Fundisa for Change programme 'Theory of Change' in practice. That is, how the programme theory has caused change on the course participants selected from the Tsitsa River Catchment. The focus is not only on the programme outcomes but also on whether the programme mechanisms informed by the programme theory have worked or not towards the enhancement of teachers practice and environmental literacy.

This study, from document analysis, empirical data gathering and analysis to report write-up on findings, has been conducted in a responsible manner and adhered to ethical standards in research practice. Since much of the data has been generated through formal portfolios of evidence designed to collate participants' teaching practices and reflections, their data has been handled with respect, dignity and privacy. As sensitive information has been generated, informed consent and confidentiality has been considered.

The 10 teachers and education participants involved in the programme's 'Teaching Water and Catchments' course for the Geography subject area senior phase were selected from the Tsitsa River Catchment area via the Eastern Cape Department of Education. The Tsitsa River Catchment was identified as a suitable area to select teachers from for a number of reasons. Firstly, the catchment context allows for 'water and catchments' topics to be explored by the teachers in teaching the school Geography curriculum. The context lends itself to the teaching and learning of some key environmental and catchment topics such as natural resources, conservation and sustainability (e.g. water in South

Africa); people, settlements and their environmental impact (e.g. land uses and environmental issues); surface forces that shape the earth (e.g. water run-off and soil erosion) amongst others.

Secondly, contextualisation of the curriculum has the potential to foster active learning activities in and outside the school and by doing so reaching out to the broader community-based actions and learning opportunities. Furthermore, the Tsitsa River Catchment also offers links to government catchment management and sustainability activities and initiatives such as the WRC Green Village project and the Department of Environmental Affairs Natural Resource Management (DEA-NRM), and Tsitsa project, formerly known as the Ntabelanga-Laleni Ecological Infrastructure Project (NLEIP).

Overall, nine teachers and one subject advisor completed all their assessment tasks successfully. The two unsuccessful candidates encountered personal and professional difficulties at the time of implementing the 'work-away assessment task'. Teachers and subject advisors required to implement either a lesson plan for Geography in Term 3 or a teacher development learning programme. The participants managed to complete the course with marks ranging from 62 per cent to 90 per cent. In general, the questions that participants struggled with at the start of the course related to aspects such as understanding ecosystems services and functions; impact of land use on natural resources, sustainability practices such as rehabilitation; and climate change mitigation and adaptation. However, participants were more familiar with identifying the causes of soil erosion, as well as an average idea about defining what a catchment was, identifying natural resources, the concept of wetlands and aspects related to settlement questions. There is evidence that the participants' knowledge expanded as a result of the training course. It seems that course participants managed to make the connections between the different elements found in a catchment, making a greater analytical and critical reflection on how human activities impact on natural resources and vice versa, how the natural environment can have an impact on human wellbeing.

Reflections from the case-study course include:

1. The programme was designed in a way that included a variety of activities ranging from listening to presentations to field excursion supported with low, medium and high order questions. The local context allowed for meaningful examples of some key environmental topics and concepts as well as the investigations of traditional practices, local knowledge and the exploration of more sustainable lifestyle choices.
2. Improving teacher's capacity for 'knowing how to teach' the content and concepts of Geography with a variety of methods, including the 'water and catchments' environmental topics, was one of the highlights of the course. Different aspects were incorporated in the programme design and materials. These included a five-day programme which allowed for a variety of demonstrations and practical activities to take place, as well as relevant water modules and core texts, the presence of experienced facilitators and encouragement of education officials, and a comfortable venue available locally for participants to work together during the day and evening.
3. The careful selection of teachers followed a process handled by the district education department. Teachers were selected based on their knowledge of the subject at hand and in some instance their interest and participation in other environmental education programmes.
4. Although the environmental focus of the course was made obvious in the activities and lesson plans developed by the teachers, it is a concern that some teachers did not pay enough attention to strengthen this focus over and above what is found in the textbooks and continued with 'business as usual'.
5. The reliance on textbooks may also constrain teachers from the use of other teaching support materials. This seems to be a common concern, as teachers tend to continue using the resources that they are familiar, without applying their creativity and making use of other sources of information. The depth and quality of the textbooks may vary from publisher to publisher.
6. Teachers are required to strive for continuous professional development. The fact that this course is both SACE endorsed and NQF accredited motivates teachers and educators to participate in such programme.

The conclusion from the teaching case study found that the Fundisa for Change course supported the enhancement of teachers' environmental learning competency in teaching the 'new' environmental and sustainability knowledge found in the curriculum. The support from the Department of Education officials was a critical factor in these achievements. The Fundisa for Change programme also proved to be a suitable framework for the development and/or adaptation of curricular and learning material with focus on 'water and catchments' content knowledge and appropriate learning pedagogies.

CHAPTER 7

Drawing from the lessons learnt and the findings of the different tasks of the project, as outlined in the previous chapters, the project makes several recommendations.

4. Review of Research Objectives

The implementation of the project achieved the following outcomes in relation to the objectives of this project:

1. ***To improve water-energy-food security as well as environmental health in rural catchments.***

A primary objective of this project was to compile a single document that would provide guidance at a household level to support integrated natural resources management within a catchment approach. By bringing all the aspects together and breaking the silo approach, explaining how activities and processes are interlinked and integrated, as well as providing the guidance for sustainable management, utilization, protection and rehabilitation of natural capital to build sustainable and resilient livelihoods at the village level. The Community-Based Catchment Management Guidelines (volume 2 of this report) provide a single reference point for government departments, private sector, donor agencies, extension workers, community-based initiatives or households to learn and understand the water-energy-food security nexus within their catchment, and provides guidance how to start addressing the challenges.

2. ***To empower and upskill rural communities to support their own green villages (incl. service delivery).***

The objective sought to empower households and communities, by using the Guideline document, to become more self-sufficient in managing their own environments and mitigating the challenges facing their livelihoods, and thereby become less dependent on Government to redress historical impacts. The guidelines include livelihoods requires and small-scale service delivery to livelihood upliftment at the household level.

3. ***To identify stumbling blocks to guideline implementation and catchment management intervention sustainability in rural areas.***

Together with the expert dialogue, and through the review of existing policy, projects and guidelines, the project identified the stumbling blocks to sustainability of natural resources related management activities in rural areas as being community ownership. This supports the need for more community-driven awareness and involvement in landscape management and rehabilitation.

4. ***To improve the state of rural catchments from the individual – > household – > village outwards.***

Through empowering households, through implementation of the guidelines, would develop an understanding of the system and interconnectedness of the household within the village, and within the catchment, i.e. that an activity at a household level does have an impact whether positive or negative on the whole system; thereby creating a shift in perception that the catchment impacts on the individual, but rather that the individual impacts on the catchment. When the sense of community exceeds the sense of self, then an individual's sense of responsibility develops; then communities will be able to move away from the "tragedy of the commons". Through the updating of the school curriculum and the

development of the guideline document, provide the materials to support raising awareness of this need to shift how households and communities think about their natural environments.

5. ***To develop an education and skills development programme to support rural job creation to support green villages.***

The original objective was to target adult further education, with the idea of upskilling learners in Natural Resources Management (NRM) activities, which in turn could be used to establish green jobs and businesses. However, during the expert dialogue at the start of the project several challenges to this objective were identified, including, inter alia:

- Attracting adult learners into this field, as opposed to more "lucrative" skills training, e.g. finances, engineering, medicine, requires the learners to understand and comprehend the impact of human activities on the environment, and the resultant water-energy-food-environment-livelihood security nexus. This nexus is not well addressed in secondary school curriculum, so the awareness to attract learners is lacking, and therefore it wouldn't be feasible to start at the end of the education process.
- The noticeable age gap in residents of the target community structures, where the number of young adults were very low due to the rural-urban migration limited the availability of participants.
- The scope of developing a SETA and Department of Higher Education accredited training course from scratch, within the project timeframe and budget, was over ambitious.

As a result of these challenges, the focus of the education programme for knowledge transfer was shifted to Secondary school education, thereby creating awareness of the water-energy-food-environment-livelihood security nexus and attracting school-leaving learners in these fields. This also provides time for the informed structuring and development of an appropriate SETA and Department of Higher Education accredited training course to support the upskilling of NRM activities into green jobs.

In addition, the project actively participated in knowledge transfer activities including regular participation in the Ntabelanga Laleni Ecological Infrastructure Project (NLEIP) (now Tsitsa project), resulting in a shift at Government level from employment driven approaches to livelihood driven approaches.

5. Conclusions and Recommendations

Key recommendations from the various aspects of this project include:

1. **Addressing issues of Land Tenure:** The complexity of land tenure in former homelands needs to be unpicked and addressed to ensure that appropriate responsibility and accountability can take place for sustainable land management, and prevent ongoing degradation of resources slipping through the administrative gaps.

2. **Revised EIA process for rural village-driven projects:** As identified, the formal legislative process to obtain the various necessary authorisations and permits for rural villages to conduct rehabilitation or preventative activities on their land, is both administratively burdensome and expensive. A more streamlined and supportive approach should be developed for these areas and types of activities, for example taking the General Authorisations approach of the National Water Act.

3. **Using a catchment approach to landuse planning, providing an integrated management approach for natural resources management:** Using a catchment approach to planning provides for the integrated and coordinated approach to resources management and moves away from the silo-approach of each Department conducting their own activities in isolation,

duplication or contradiction of other Departments and role-players operating within the catchment area, as well as conducting landuse planning in isolation of the environment, its natural capital and ecological infrastructure and function. This allows all activities to work towards the same goals, and each department implementing its relevant activities in support of the central goal.

This is also applicable to the *Working for* Programmes that focus on individual aspects but not working within a systems approach. By using a village-based catchment management plan can guide the *Working for* programmes more realistically in terms of landscape rehabilitation to achieve more sustainable ecological and employment objectives.

4. **More education workshops with teachers:** The case study that was run in partnership with Fundisa for Change has received much interest and requests for more of such programmes to be run across the Eastern Cape, and potentially in other rural areas of the country too. By capacitating the teachers and developing their pedagogical knowledge and skills, they are more confident to teach the curriculum content thereby improving the student's knowledge. Rolling out the case study to other areas will also provide more substantive analysis to assess improvement of the quality of teaching on the national scale.

5. **Translation of the Guidelines into isiXhosa and Nguni to reach a wider audience:** The guidelines have been developed in English. The WRC should consider translating these into both isiXhosa and Nguni in order to reach a wider audience for implementation. Furthermore, the guidelines are suitable for extension work in the villages, this could be further supported by illustrated summaries in support of educational materials and illiterate households.

Overall the project has achieved its objectives, both within budget and timeframe. The development of the Guidelines and the Education Programme have received extensive interest and provide a foundation for future work in these fields.

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Mr M Smith	Economica (Pty) Ltd
Ms D Cindi	SANBI

This project was actively represented at the Ntabelanga Laleni Ecological Infrastructure Project (NLEIP) project (now called Tsitsa Project) to raise awareness of the work and the need to work towards resilient livelihoods within landscape rehabilitation projects.

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[1] WRC Project K5/2423: Investigation and demonstration of how integrated green innovations and technologies can be utilized to create entrepreneurship/jobs that improve the economic conditions of communities in the upper Umzimvubu River (Ntabelanga) and Okhombe, within Jo Gqabi and Thukela District Municipalities, respectively.

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CA	:	Conservation Agriculture
CAPE	:	Cape Action for People and the Environment
CAPS	:	Curriculum and Assessment Policy Statements
CBA	:	Cost Benefit Analysis
CBNRM	:	Community Based Natural Resources Management
CLICS	:	Climate Change Integrated Conservation Strategies
CM	:	Catchment Management
CM/NRM	:	Catchment Management / Natural Resources Management
CMA	:	Catchment Management Agency
CMO	:	Context-Mechanisms-Outcomes
CSA	:	Conservation South Africa
DAFF	:	Department of Agriculture, Forestry and Fisheries
DBE	:	Department of Basic Education
DEA	:	Department of Environmental Affairs (*formerly DEAT*)
DEA-NRM	:	Department of Environmental Affairs: Chief Directorate Natural Resource Management
DEDEAT	:	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism
DHET	:	Department of Higher Education and Training
DM	:	District Municipality
DoE	:	Department of Education
DRDLR	:	Department of Rural Development and Land Reform Eastern Cape)
DST	:	Department of Science and Technology
DUCT	:	Duzi-Umngeni Conservation Trust
DWS	:	Department of Water and Sanitation
EBA	:	Ecosystems Based Approach
EC	:	Eastern Cape
EI	:	Ecological Infrastructure
ELRC	:	Rhodes University Environmental Learning Research Centre
EP	:	Environmental Programmes (under DEA)
EPIP	:	Environmental Protection and Infrastructure Programmes (under DEA)
EPWP	:	Expanded Public Works Programme
ESD	:	Education for Sustainable Development
ETDP	:	Education and Training Development Practices
FET	:	Further Education and Training
FfC	:	Fundisa for Change
GET	:	General Education and Training
GHG	:	Green House Gases
GIZ	:	Deutsche Gesellschaft fur Internationale Zusammenarbeit
IMSC	:	Information Management and Sector Coordination (under DEA)
ISDA	:	Institutional Strengthening Department of Agriculture
IWCDP	:	Integrated Wild Coast Development Programme
IWRM	:	Integrated Water Resources Management
M&E	:	Monitoring and Evaluation
MSTF	:	Medium-Term Strategic Framework
NC	:	Natural Capital
NCCRD	:	South Africa's National Climate Change Response Database
NCS	:	National Curriculum Statement

NEEP	:	National Environmental Education Programme
NEMA	:	National Environmental Management Act, Act 17 of 1998
NGO	:	Non-Governmental Organisation
NLEIP	:	Ntabelanga Laleni Ecological Infrastructure Project
NQF	:	National Qualifications Framework
NRM	:	Natural Resources Management
NSDF	:	National Sustainable Development Framework
PEP	:	Public Employment Projects (Expanded Public Works Programme)
PoE	:	Portfolio of Evidence
PTO	:	Permission to Occupy
PV	:	Photo Voltic
RSA	:	Republic of South Africa
SACE	:	South African Council for Educators
SANBI	:	South African National Biodiversity Institute
SANParks	:	South African National Parks
SER	:	Society for Ecological Restoration
SETA	:	Sector Education and Training Authority
SGBs	:	School Governing Bodies
SPLUMA	:	Spatial Planning and Land Use Management Act, Act 16 of 2013
STEM	:	Science, Technology, Engineering, and Mathematics
SWC	:	Soil and Water Conservation
TDN	:	Teacher Development Network
TLSM	:	Teaching and Learning Support Materials
UCCP	:	Umzimvubu Catchment Conservation Programme
UEIP	:	Umngeni Ecological Infrastructure Project
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
UNISA	:	University of South Africa
WESSA	:	Wildlife and Environment Society of South Africa
WISA	:	Water Institute of South Africa
WMA	:	Water Management Area (Primary catchment area)
WRC	:	Water Research Commission
WWF	:	World Wildlife Fund

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1 INTRODUCTION

1.1 MOTIVATION FOR THE PROJECT

Economic growth and development depend largely on water quality and availability, which are affected by competing demands between people, industry, food security, the environment, and development; all of which impact on the land and land use, which in turn impacts on the quality and availability of water. “Most rural communities do not see the land as a (major) source of livelihood. Natural resources have lost much of the driving value they might once have held, and which they still hold in other less industrialised and commoditised African countries” (Dr Ben Cousins, pers. comm). It is difficult for poverty-stricken people to feel motivated to improve their land-care practices when the effort brings few perceived immediate benefits. Further, the argument of downstream impacts is irrelevant at this level. Communities need other incentives to improve Catchment Management (CM) and general Natural Resources Management (NRM) practices and reduce impacts to their own and downstream environments.

Ntabelanga Catchment, in the Eastern Cape, is a good example of this catchment dynamic. Falling within a former homeland area it is historically poorer; sections of the catchment are ripe for economic development. This development whether urbanisation, agricultural or industrial requires adequate and reliable water supply and water quality, and electricity. However, due to excessive erosion in the upper catchment areas resulting in excessive sediment loads downstream in the main rivers, makes investment in the necessary water infrastructure (e.g. water storage, irrigation schemes, and hydropower) unfeasible as the cost of maintenance to manage the siltation of the infrastructure is too expensive. At the same time, the communities that would benefit from these economic developments are left to rely on the natural resources of the catchment for their livelihoods, which in turn contributes to the further degradation of the catchment.

Water resources degradation and land degradation are interlinked. In order to improve the state of water resources, one needs to improve the state of land resources and land use activities. According to the International Fund for Agricultural Development, by 2011 about 1.2 billion hectares (ha) of land had been degraded by various human activities over the preceding 45 years; and an estimated 5 million to 12 million ha are lost annually to severe degradation in developing countries. The causes of this degradation include deforestation, biomass burning and agricultural practices such as repetitive tillage and inadequate application of nutrients as well as not addressing (rehabilitating or mitigating) erosion issues when they start. Land degradation results in loss of soil fertility and increased soil erosion, resulting in loss of arable land. Eroded land is unproductive and results in the physical loss of land for any land use; and the eroded soils result in the siltation and contamination of water resources, thereby impacting the usability of the water resource, e.g. Ntabelanga catchment.

Erosion control and rehabilitation, and sediment management in an agricultural catchment with mainly resource poor farmers, needs to focus on sustainable and resilient rural livelihoods, increased yields and farm profitability by addressing causes of and reasons for erosion (treating the “causes” of erosion). Physical and engineered measures can then be implemented when and where erosion is still a problem or requires extensive rehabilitation (treating the “symptoms” of erosion). The need for Water Resources Management (WRM) is also critical to sustain rural household livelihoods and the basis of a green village and a green economy. Currently natural resources management in these rural areas relies on the strength of traditional and cultural institutional structures – the competency and interest of which varies from chiefdom to chiefdom. Integrated Water Resource Management has become a well-accepted concept in South Africa but is actualised primarily at the level of the primary catchment or Water Management Area and not at the rural homestead or village level (Quinary catchment scale).

Integrated resources management approaches include integrated catchment management and are characterised by a proactive, all-inclusive and systems-based approach to natural resource management challenges. It is a means of safeguarding the natural resource base, improving agricultural productivity and sustaining livelihoods. The integrated approach moves away from managing resources and specific ecosystems in isolation of each other, but rather brings the management of their utilisation and rehabilitation together in a coordinated and collaborative approach. For example, addressing siltation of rivers requires improved management of land-based activities and can't be addressed solely in terms of water resources or aquatic ecosystems management alone. The aim of community-based catchment management, the focus of this project, is not only to protect and restore the natural resources, but by doing so also provide sustainable and resilient livelihoods so that the integrity of the communities that depend on the resources through farming, livestock, fishing, forestry and other activities are not detrimentally threatened by disasters, degradation or other risks, and thereby stimulating the Green Village and Green Economy concepts.

1.2 AIM OF THE PROJECT

The key issue in rural areas is usually the influence of population pressures on the existing landscape-biodiversity dynamics. Whereas many years ago, prior to industrial revolution, when humans lived in unison with nature this was not an issue, but with an increasing demand for natural resources and under the influence of historic-political and socio-economic influences the human footprint has pushed many natural systems beyond a stable threshold. One may consider the human population balancing on the foundation of natural resources as illustrated in Figure 0-1, with the main foundation being land, water and air; and the second tier being plants and animals. Any disruption to the foundation layers would naturally impact the human population, more so in rural areas where communities still depend on subsistence farming, natural resources, and government grants to sustain a living.

The solution does not lie in working with the top layer, but rather starting rehabilitating the basic foundations of the resources and working on the interconnectedness between the tiers. Only then will rural communities be able to sustain themselves again.

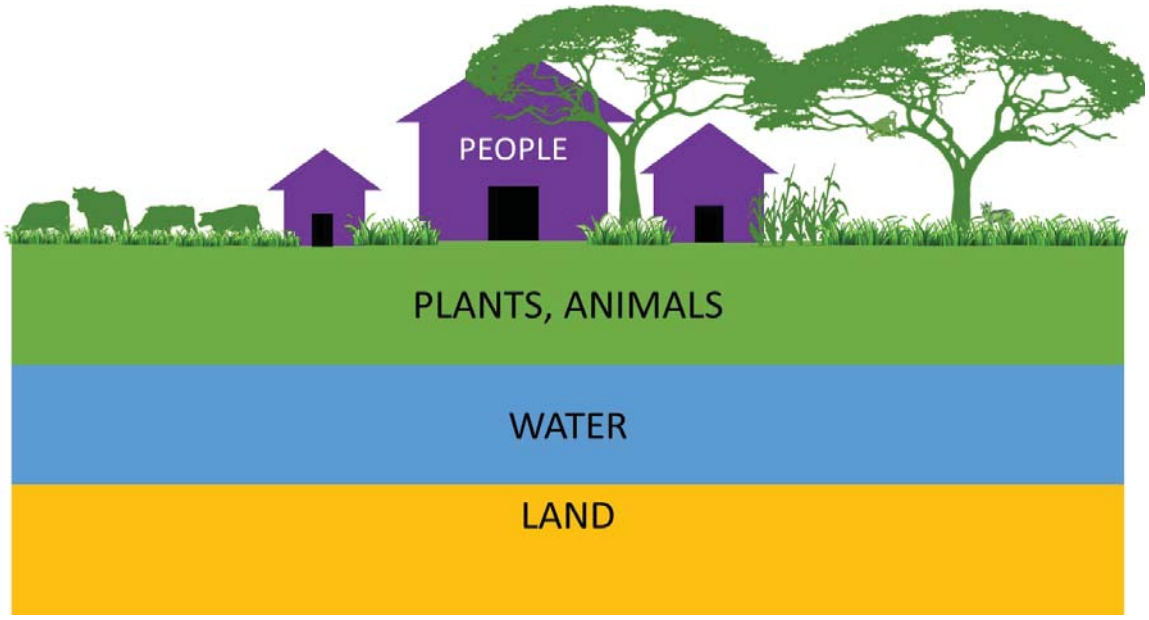

Figure 1-1: Foundation structure of natural resources

Non-urban populations face challenges that are both cause and consequences of environmental degradation. A dependency on natural resources leads to degradation and depletion under the pressures of high population growth, historic-political, socio-economic issues and biophysical aspects. In some cases, these aspects are interconnected and share a cause/response relationship. The ongoing over-utilisation of natural resources without accountability or responsibility for the resultant impact is unsustainable and limits economic development. There needs to be a shift in thinking from how the catchment affects the household, to rather how the household affects the catchment. When the sense of community exceeds the sense of self, then an individual's sense of responsibility develops; then communities will be able to move away from the "tragedy of the commons" and uplift themselves and their livelihoods. The aim of the project is to contextualise the household within the catchment, and building the relationship between household, the village, the community and the broader catchment. This objectives of achieving this aim are:

1. To improve water-energy-food security as well as environmental health in rural catchments.
2. To empower and upskill rural communities to support their own green villages (incl. service delivery).
3. To identify stumbling blocks to guideline implementation and catchment management intervention sustainability in rural areas.
4. To improve the state of rural catchments from the individual – household-village outwards
5. To develop an education and skills development programme to rural job creation to support green villages.

1.3 PROJECT LOCATION

This Project was specifically undertaken in the Mzimvubu Catchment in the Eastern Cape, but the outputs and concepts are applicable across the country.

The Mzimvubu to Keiskamma Water Management Area occurs predominately within the Eastern Cape Province, with Lesotho bordering it to the north. The Mzimvubu River originates on the border of Lesotho, with the Tsitsa and Tina Rivers converging from the north-west. The Ntabelanga catchment occurs within the upper reaches of the Tsitsa River (Figure 0-2Figure 0-2: The location of Ntabelanga subcatchment within the Mzimvubu Water Management Area

). The catchment is part of Elundini Local Municipality, within Joe Gqabi District Municipality.

Figure 1-2: The location of Ntabelanga subcatchment within the Mzimvubu Water Management Area

The demographics of the area are indicative of a rural population made up of mostly the elderly (65+) and young (0-14), with more than half of the households being headed by women (StatsSA, 2011 Census data). Nearly half the households in the area have access to electricity but only 10% have access to piped water. These statistics highlight the social and infrastructural constraints which have limited the economic development of the region. In general, the area is representative of rural areas in South Africa whereby those eligible to work move to the urban centres, leaving the young and elderly behind, abandoning farm land to continuing erosion and environmental degradation, Figure 0-3.

Figure 1-3: Unattended erosion continues to degrade abandoned fields, Eastern Cape (Source: S. Braid)

Many projects have been run in the area for the past ten years, funded by a variety of sources. More recently the Mzimvubu Water Project has been initiated by the Department of Water and Sanitation (DWS) as a solution to the socio-economic constraints of the region. This project has drawn public attention due to the significant sedimentation risk for any dams on the Mzimvubu River. This is in part due to the area having steep, overgrazed slopes as well as due to the presence of dispersive soils. These environmental factors have meant that most of the Mzimvubu catchment is prone to erosion. Land management and rehabilitation is therefore key to limit the amount of sediment being delivered to the proposed dam, and to prevent further loss of natural capital and resources and resultant negative impacts to the livelihoods of the rural communities.

1.3.1 Historic-political aspects

Various political and administrative hurdles in the rural areas of South Africa have meant that land ownership, and inherently land use has been an important issue in managing the landscape. The initial forced removals resulting in the creation of homeland areas, concentrating racial groups of people onto specific land parcels e.g. the Transkei, which were usually environmentally sensitive lands (high erosion potential, low agricultural potential, steep slopes, little water availability, etc.). In the former Transkei the traditional settlement patterns, of scattered rural dwellings over the landscape, was consolidated into more defined villages, while cropping and grazing areas were demarcated and fenced off according to government policies in the earlier part of the century. As described above, this "Betterment Planning" resulted in defined property boundaries without consideration of traditional settlement patterns. This has left a large area of "state land", which is not necessarily managed effectively.

The high level political and administrative management strategies have been particularly influential in the Eastern Cape, where it could be said that they have surpassed natural factors in importance when considering the significant land-use and land cover change in this region (Fabricius *et al.*, 1996). Historically farming practices in the Transkei area involved mixed farming, which integrated production of livestock consisting mainly of cattle; crop production on one or more fields; and vegetable production in home gardens (Lent, Scogings, & Van Averbeke, 2000). Prior to 1960, the households were settled in the typical scattered clusters in which homesteads were closely attached to their arable lands including fields (amasimi) and grazing (amadlelo) lands were constituted by both patches of commonages in-between settlements and further afield. During this period land in the form of all the three categories of residential, arable and grazing, was held under customary tenure system. But all this changed with the implementation of betterment planning which was implemented unsystematically from the early 1960s, right through to the late 1970s. Betterment planning consisted of government programmes to combat erosion, conserve the environment and improve agricultural production in the homeland areas. Betterment areas were to be planned on the basis of economic units, designed in such a way that households should have access to an amount of arable land and grazing that would provide it with a set minimum annual income. The Betterment planning project involved spatial re-organization of land into distinct zones of residence, crop cultivation and livestock grazing. Where Betterment was implemented fully it resulted in relocation of households to planned settlements. These high stock densities have mainly been blamed for the severe land degradation in the area (Trollope & Coetzee, 1975; Forbes & Trollope, 1991), but in reality, it is a combination of environmental factors such as steep slopes; an increase in rainfall intensity and magnitude; deforestation and inherently erodible soil which have led to land degradation.

In terms of Proclamation R188 of 1969, two forms of tenure were recognised − quitrent for surveyed land[2] and 'Permission to Occupy' (PTO) for unsurveyed land. For the latter, chiefs and headmen were to undertake the task of allocation, agricultural officers to survey the boundaries of sites and fields, and magistrates to issue PTO certificates. Registers of permit-holders were to be kept at the magistrates'

[2] The extent of prevalence of quitrent tenure in the catchment could not be quantified in this current study, but early indications suggest that there is either no or very little quitrent tenure on the catchment.

offices. The manner and degree to which these formal requirements were implemented varied across the catchment area. The PTO system was implemented unevenly in different parts of the catchment.

The institutional arrangements as well as the system through which PTOs were issued started to collapse from around 1996. Magistrate's offices no longer took part in the system of administration of the PTO systems. The officials of the then Provincial Department of Agriculture were at different points also removed from this function and the function constitutionally fell under the then Department of Land Affairs (DLA). Many of the PTO records are kept in conditions which are not ideal in different offices of the Department of Rural Development and Agrarian Reform.

Land administration were constantly identified as some of the biggest hurdles for development in the region (Phillip *et al.*, 2014; Adams *et al.*, 2000). The Integrated Wild Coast Development Programme Diagnostic Report highlights, land administration in former Bantustan areas such as in the Wild Coast as largely collapsed during the transition to democracy between 1994 and 2000. Effective public land administration and the recording of land rights is a necessary but not sufficient condition for security of tenure.

In the interim, because the land is still nominally owned by the state, various decisions in respect of the land have legal status only if they are taken by the Minister as trustee or nominee. These decisions relate to matters such as township development, subdivision, granting of servitudes, leases, mortgages and sales. If the resident's do not believe they own the land they will not have the incentive to look after the land and invest their time and resources into looking after it, resulting in a tragedy of the commons effect. Furthermore, decisions taken must be consistent with existing laws. For example, they cannot undermine rights such as those set out in the Interim Protection of Informal Land Rights Act, 31 of 1996. In situations of group based, communal and/or tribally based land rights the members of the relevant group, community or tribe should be treated as the co-owners of the land, even though formal legal ownership may be held by the State. Any decision in respect of ownership issues is valid only if it reflects the views of the majority of "co-owners". A critical feature of this policy is that the rightful ownership of communal land vests in the members of the group which holds the land.

The unfortunate situation is that the state has not yet promulgated the proposed legislation as directed by the Constitution. This results in a situation where land rights holders in communal areas are having very insecure tenure rights. The occupation, use and access to land is not backed up by any form of recognized public record or written contract. If left as it is, this state of affairs is going to create a number of challenges at various stages in the unfolding of the process. During the preconstruction phase, absence of land records is going to create a very complex environment for the process of negotiation and subsequent acquisition of rights. During construction, conflicts are inevitable, which could result in litigations, which could hold the process at ransom, at a high cost. Post construction, the absence of accurate information on land rights is going to make the task of the Proto CMA that much more difficult in promoting appropriate land use practices within the catchment. The principle is that "if you do not know it, you cannot manage it" is important in this regard. The land information system is therefore a critical data system to inform future catchment management strategies.

The general lack of clarity about the status of such land tends to create serious disputes in such areas, which are typically triggered when a change in land use or a development is proposed. While many of such disputes are among members of the communities they also tend to degenerate into a conflict over power and authority between government and traditional leadership and some sectors of the communities.

1.3.2 Social-economic aspects

The historic-political aspect provides a legacy of poverty in rural areas in South Africa, with the socio-economic aspects providing the current and future trajectory. Poverty can be absolute, characterised by severe deprivation of basic human needs, or overall, characterised by lack of income and productive

resources to ensure sustainable livelihoods, hunger and malnutrition, ill health, limited or lack of access to education and other basic services and increased morbidity and mortality from illness, homelessness and inadequate housing, unsafe environments and social discrimination and exclusion (UN, 1995). Poverty in terms of income can be either chronic or episodic. Chronic poverty tends to be higher in rural areas under female headed households, older household heads and those households with below average access to less arable land. Episodic poverty refers to a key member of the household losing a job. Quality of life does not concern personal income, rather the experience of well-being. A major contributor to quality of life is access to services and infrastructure, all of which impact quality of life by reducing time and energy needed to collect water or fuel, diminishing water quality risks, improved waste disposal and engagement in economic activities. This also concerns inequalities which are felt in rural areas, as there is an unequal distribution of wealth, and services.

Historic-political aspects provided a legacy of poverty in rural areas, but also acted to disconnect rural communities from the environment. Pre-1994 the government did attach considerable significance to conservation, but this usually involved excluding local people from environmentally protected areas. Communities were removed from protected land and relocated to inferior land unable to withstand the added pressure, hence reinforcing the view that poor people negatively impact the land. A more holistic view would be to consider the complex relationships existing within each system, with humans forming an important, although powerful, part of the system.

Current environmental governance strategies are well aware of the importance of addressing poverty as a key component of addressing environmental degradation, but in practice there have been limited success stories. Conservation public works programmes have attempted to address both the issues of poverty and environmental degradation. These programmes consist of a paid wage for the achievement of a conservation task, with a fair amount of attention paid to related activities such as education, skills transfer, and creation of secondary industries, all financed through the Poverty Alleviation Fund, however the priority is on employment disguised as conservation work.

The real benefit of these programmes are rather prevention of further alien invasive encroachment and soil degradation, both which require diligent maintenance. This maintenance is not conducted by the communities involved as they see it as an opportunity to acquire extra income. In some cases, it has even been noted that communities may actually view erosion gullies as a valuable commodity, especially when it means jobs and income. However, these jobs are not sustainable unless the maintenance is converted into Green Job based on viable business proposition, with funding sourced beyond government and the private sector. Criticism has also stemmed from the disengagement of communities with the environment, as paying wages for looking after their own resources is akin to expecting the government to solve the problem. It is likely that the programmes themselves are in danger of eroding the ethos of conservation they are trying to uphold. Another argument for a lack of “ownership of the problem” relates to the issue of communal land tenure, as there is a literal lack of ownership of the land. On the other side of the coin are the direct investments made by the government into providing infrastructure in rural areas. This is both in terms of basic services and housing projects.

There is a perception that the poor do not save, or require access to financial services because they have little or no income, when in fact the opposite is true. It is because the incomes are small, irregular and unpredictable that managing this money becomes a central concern (Delany and Storchi, 2012). This requires regularly engaging in multiple transactions, borrowing when incomes are low and saving to secure money for future expenses. The National Development Plan 2011 (NDP) proposes a range of initiatives to deal with rural poverty, and places a strong emphasis on agricultural activities. However, the rural poor are moving out of agricultural enterprises and becoming more dependent on government welfare programmes (SaveAct, 2014-2015) or relocating to urban centres. This does not build communities’ self-efficacy and financial capability; and leads to a continual cycle of dependence and poverty. What is required is a solution which best complements the social grant distributions, enabling the poor to save and develop ways of managing their money in a debt-free way, build their assets and invest in income generation. It also requires an awareness of the multiple streams of income available

to rural communities, i.e. a majority of households receive social grants or rely on a family member sending money from elsewhere. Formal employment is low, although most households are involved in small scale agriculture in some way.

1.3.3 Biophysical aspects

As already mentioned, the poor are often blamed for environmental degradation, without much thought into the issues or constraints that overlie the human-environment interactions of rural areas. It is true that humans exert a dominant negative role in the environment, with natural resources getting depleted at a faster rate than they are renewed, but a systemic understanding is required in order to see the bigger picture of environmental degradation in rural areas.

Land degradation is one of South Africa's most critical environmental issues, intricately linked to food security, poverty, urbanization, climate change, and biodiversity loss. Land degradation is not just the physical degradation of the soil, but the disturbance of the biophysical environment through human activity. This occurs through activities such as overgrazing, deforestation, alien invasive infestation, poor solid waste management and other similar such disruptive actions. This leads to a disturbance of the natural system and in some cases pushes a system beyond a critical threshold from which it is very difficult to return. Such cases are seen through the effects of exposing soil by overgrazing or deforestation, leading to soil erosion, loss of soil nutrients and the infestation of alien invasive plants. The impacts of land degradation are long-term and damaging to not only the biophysical environment, but the socio-economics of a community too. A loss of soil fertility will lead to low crop yields, which in turn lead to food shortages and reduced income generation, whilst increased runoff due to exposed soil and soil erosion leads to gully erosion and sedimentation of water bodies, leading to biodiversity threats and water resources depletion and degradation, and a reduced capacity to use the water resource e.g. for irrigation or hydropower. In general, the impact that is readily felt in rural communities is a reduced standard of living, which leads to chronic poverty.

The evolution of the National Water Act, Act 36 of 1998 ("water law") has meant that water resource managers have been given the policy and legal framework to manage land use activities that increase a catchments sediment yield, but implementation has been constrained by a lack of both financial and human resources (Slaughter, 2011) and a disconnect between all the role-players managing land use activities. It may also be said that the methodology of addressing one component of the system is not effective when considering the complex relationship between land, water, plants, animals and humans in terms of land degradation. Addressing an erosion gully (land) without looking at the related layers of plants, animals and humans will not be sufficient or sustainable. This is particularly true when considering the importance of rehabilitation, maintenance and monitoring.

Under the influence of climate change there has been an increase in extreme climatic events. Rainfall events have become more erratic and intense, droughts are more likely and temperatures are swinging to extremes on either end of the spectrum. Changing rainfall seasonality will have a particular impact on farm crop selection and planting regimes. With more rain falling as heavy storm events it will be less effective, and there will be increased erosion, an increased risk of flooding, and greater environmental degradation. Higher evaporative demand will offset any benefits should rainfall possibly increase, also resulting in less effective rainfall. Altered rainfall and evapotranspiration rates will impact on the vegetation, with an increased pressure on marginal species. Ultimately biological diversity is reduced. These changes also have societal impacts through crop yields, as well as on the forestry industry. Climate changes may alter human health and settlement distribution with disease vectors changing in response to temperature and moisture availability. The impact of changes in rainfall patterns to the flow dynamics of the catchment make proper sustained catchment management implementation ever more essential.

Air quality in rural areas remains a neglected issue. The common belief is that rural areas are free from air pollution, whereas on the contrary air quality in the rural may be more polluted than some of the urban areas. Rural areas suffer from outdoor air pollution, as well as indoor air pollution. A major source of air pollution is the burning of coal or wood for fuel. This happens both outside and inside dwellings, which leads to various health problems mainly affecting the respiratory and cardio-vascular system.

1.4 STRUCTURE OF THE PROJECT AND REPORT

Chapter 2: Roadmap Framework. Catchment management is not just about managing the water resource, but also the land use-, natural resource management-, land tenure- and customary law nexus. The dialogue aimed to bring together various specialists from water resources management, social sciences and government to engage in dialogue around catchment management at the village level, especially in the absence of water management institutions that accommodate the nexus. The dialogue contributed towards compiling a Roadmap Framework for the project and longer-term programme.

Chapter 3: Lessons learnt. There have been many Natural Resources Management-based projects that have been implemented across the country. Some of these have been very successful, some haven't, some were initiated by communities themselves, others were driven by funding agencies. Materials on these projects were collected. Projects that were included considered: (i) Where there were historic but abandoned interventions which may, or may not, have left their mark and some continuity; (ii) Where there are continuing interventions – but self-sustainability remains a prospect; (iii) Where there are continued interventions "propping up" projects with no sustainability in sight; and (iv) Areas where management has been effective, but where this has evolved naturally and without intervention. It is also important to recognise that examples of sustainable stocking rates, rotational grazing etc., are also very important examples of catchment management success. The materials were reviewed and the projects evaluated to determine lessons learnt from these projects, to evaluate the successes and how these could be replicated, and why there were failures and how these could be avoided or mitigated. Field visits to selected project sites were undertaken, together with stakeholder engagement.

Chapter 4: Technical Green Village Guidelines. There are existing guidelines and materials on best practice developed in South Africa and across Sub-Saharan Africa on various aspects of natural resources management, these were sourced. The existing guidelines were reviewed for synthesising, consolidating, contextualising; identify gaps and seek to close these gaps, both through writing up missing areas, but also if necessary, motivating the further research. The guidelines were compiled as a "how to" handbook aimed specifically and directly at communities. A document that villagers can pick up and use without requiring expensive consultants to support or outside intervention. A document that covers the basics of conservation agriculture, wise use, green energy, land restoration, rehabilitation, water services, etc.; where the scale of 'catchment' is not strictly a hydrological distinction but the area of concern to local people (household and village-catchment). This is a consolidation of existing guidelines – in a style and format that is accessible, contextual, understandable and logical to rural landholders, households and communities.

Chapter 5: Education Review and Curriculum. There needs to be education of youth in their developmental stages in order to implement Green Village practices as part of daily routine. The first step was a review of the existing curriculum and teaching aids. Secondly the materials that exist and that are developed are not self-initiating and require cognitive input into their implementation, and so the curriculum was revised and updated.

Chapter 6: Case study report. Implementation of the curriculum and training in the utilisation of the guidelines was implemented through a case study.

Chapter 7: Project Conclusions. Final summary, recommendations and project conclusions drawn over the duration of the project.

2 ROADMAP FRAMEWORK

2.1 PURPOSE

This “Roadmap Framework” was developed from the outcomes of an expert dialogue workshop held at the Aurecon offices in East London on the 28th January 2016. The purpose of the workshop was to bring together different specialists from water resources management, social sciences and government to engage in dialogue around catchment management at the village level, especially in the absence of water management institutions that accommodate the land use-natural resource management-land tenure-customary law nexus.

The expert dialogue participants included members of the project team, team members from the WRC K5/2423 Green Village Project, government officials, NGOs and engineers working in the same field or geographic area. Discussions ranged from what projects are currently or have previously been conducted in the area to ways for similar projects to be aligned. The outcomes of the expert dialogue informed the development of the Roadmap Framework.

The purpose of the Roadmap Framework was to review the proposed work programme for the project with reference to the outcomes from the expert dialogue workshop. The following are outcomes of this framework:

- Establish what other Natural Resources Management based projects are currently/have previously been conducted in the Ntabelanga catchment (Eastern Cape), in order to align with and support current projects and prevent overlap.
- Develop a template for recording key information in the review of local, national and international Natural Resources Management based projects.
- Develop a long-term programme for the project.

2.2 EXISTING AND CURRENT PROJECTS

The expert dialogue workshop outlined the current and historic projects which have been conducted in the area. The types of projects identified ranged from infrastructural to social and land management based. It is apparent that communities in the area have been exposed to a variety of initiatives throughout the years, with limited long-term sustainability (Table 0-1).

Table 2-1: Projects discussed during the expert dialogue workshop (current at the time of the dialogue)

Project	Project leader	Description
Mzimvubu Water Project	DWS	The Department of Water and Sanitation (DWS) commissioned the Mzimvubu Water Project with the overarching aim of developing water resources schemes (dams) that can be multi-purpose reservoirs in order to provide benefits to the surrounding communities and to provide a stimulus for the regional economy, in terms of irrigation, forestry, domestic water supply and the potential for hydropower generation. The Mzimvubu River is regarded as the only major river in the country which is underutilised, and is considered by the Eastern Cape Provincial Government as offering one of the best opportunities to address the socio-economic challenges of the region. That said, the catchment also consists of highly erodible soils with widespread erosion and sedimentation downstream evident. The DWS was investigating the feasibility of the Mzimvubu Water Project, which involves the development of dams at Ntabelanga and Laleni sites, a hydropower scheme at Laleni and water treatment works at Ntabelanga, bulk water infrastructure and flow gauging stations.
Integrated Wild Coast Development Programme (IWCDP)	DEDEAT	The Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) is coordinating the IWCDP on behalf of the Eastern Cape Provincial Government. The strategic framework ensures a holistic approach to socio-economic development in the eastern part of the Province and aims to break the poverty trajectory of communities. The headline areas of focus are: "Put the Future First" (including Early Childhood Development, Health and Education), "Get the basics Right" which focusses on systemic issues such as land tenure, infrastructure and water and sanitation among others, and "An Integrated Approach on Public Employment Programmes (PEPs)". During the current phase of the Mzimvubu Water Project a number of visits to communities in the Wild Coast were conducted. Land tenure and land administration were constantly identified as some of the biggest hurdles for development in the region. A project is currently being run by Phuhlisani to develop a local land register in order to identify land rights holders before the dam is built.
WRC K5/2423 Green Village Project	WRC	Another Green Village project was being conducted (K5/2423) in the same area. This project is entitled: "Landscape greening in the Tsitsa catchment in South Africa, aims at improving the socio-economic conditions of Ntabelanga and Okhombe communities through integrated green innovations. The multi-institutional project is based in two provinces of South Africa". Professor Kate Rowntree,

Project	Project leader	Description
		from Rhodes University, is heading the project based within the Ntabelanga community. The main idea behind the project is to bring in a business framework for communities to get an income from the land. The key deliverables were to develop and test appropriate mechanisms and manuals for landscape development and management; to integrate a green solutions toolbox and business framework with government departments; and to develop a framework from a household to a national level. There are certain overlaps in this project with the Catchment Management Guideline project, which allows for a collaborative approach so as not to "re-invent the wheel". The Catchment Management Guideline project will be developing a guideline which will be tested within the Landscape Greening project.
NLEIP	Rhodes University	Various post-graduate researchers from the Geography Department at Rhodes University are currently working on erosion projects in the area. These projects will look into the sediment sources and loads that flows into the Tsitsa River.
"Working for"	DEA	There are ongoing Expanded Public Works Projects (EPWP) and Natural Resources Management (NRM) groups of Working with-Programmes operating in the project area.
uMngeni Ecological Infrastructure Partnership (UEIP)	SANBI	The UEIP aims to augment and enhance the efficiency of engineered infrastructure. The UEIP also focuses efforts towards co-ordination of EI related projects. Projects focus on water production, erosion control, enhancement of water quality and flood attenuation.
Duzi-uMngeni Conservation Trust (DUCT)	DUCT	The DUCT has successfully reduced alien invasive vegetation over 100 km of river banks. The Land Care, River clean-up days, Enviro champs and River Care Team all act to reduce pressure on engineered infrastructure by restoring rivers to their natural states. The real revolution with DUCT has happened within the community as people living and working in these areas have had life changing experiences, interactions and insights. People are influenced through the schools' education outreach programme or have worked through the ranks of the DUCT River Care Team and Enviro Champs. People have had training in various aspects of their work and are now incredibly proud of their teams' achievements in making the Duzi and uMngeni Rivers healthier. This indicates that a combination of schools and adult education contribute to a sense of community ownership of the project.

2.3 NESTED CHALLENGES

Challenges and issues that arose through the dialogue workshop included:

- Age gap:
  - The population of the area has a notable lack of able-bodied individuals as most young people move to urban centres to find work. This means that there is a high occurrence of elderly and very young people, which results in a low availability of local labour available to work on land management systems. This challenge needs to be considered when developing the guidelines. This outcome contributed to shifting the education focus of the project from adult education to school-based education.

- Land-reform and land administration systems (nested in Land tenure):
  - Where does decision making in terms of the different elements of NRM take place? Who is responsible for rehabilitation of historically degraded lands?

  - This is not only a challenge, but presents an opportunity in the form of customary law practice. This supports bottom up processes of developing rules and enforcing those. Customary law could be an opportunity to explore. Land administration systems in the former homeland (communal) areas has collapsed. The old order Permission to Occupy system is no longer functional and has not been replaced. Land tenure rights do not mimic the urban one on one link between owners. Land rights are nested in complex configuration, constituted by individuals, household groups and extended family networks, neighbourhood, village, administrative area, traditional council and kingdom. This paper-based system needs to be replaced with an electronically and GIS linked land information system. The UN Habitat GLTN has developed a tool for this purpose (Social Tenure Domain Network).

  - The challenge of Land Tenure in former homeland areas is discussed further in Appendix A.

- Adult education:
  - The implementation of the guidelines has focused on catchment management being integrated within the school syllabus. Although this is worthwhile in the long term, in the short term it is important to also focus on adult education.

  - Long term sustainability will occur through educating school children; whilst short term action will occur through educating the adult community. This result together with the Age Gap shifted the education focus of the project from adult education to more sustainable school-based education.

- Legislation:
  - There are complex and burdensome administrative processes to conduct rehabilitation and NRM activities, especially for rural areas.

2.4 TEMPLATE FOR “LESSONS LEARNED” LITERATURE REVIEW

The outcome of the expert dialogue indicated that there have been and are many natural resource management initiatives nationally and internationally implemented under the concept of “community focused catchment/watershed management”. It was considered important to outline a template for

analysing these initiatives to determine lessons learnt for future works and relevance to this Catchment Management Guideline project. Important data fields were identified as the following:

- Natural Resource Management, which could be:
  - Historic intervention
  - Self-sustaining intervention and continuing
  - Not self-sustaining intervention but still being propped up and continuing
  - Self-sustaining intervention, continuing with effective management
- Implementer, including the following:
  - Client / Organisation
  - Contact details
- Timeline of implementation
- Place implemented, including the following:
  - Province / country-wide
  - Community involved
- Success/Failure, including the following:
  - Reasons for success / failure
  - Was the project driven by the community / through external parties
- Focus and activities of the project

Relevance to the Catchment Management Guidelines

2.5 LONG TERM PROGRAMME

The long term aim of the Catchment Management Guidelines project is not to “re-invent the wheel” but rather to compile a single source reference aimed at resource-poor farmers and rural villages. The guidelines will rely on local knowledge and pull from existing projects where possible, covering Green Village activities ranging from the household to catchment level. Ultimately this will be a “how to” handbook in understanding, managing and rehabilitating the local environment.

Outcomes from the expert dialogue indicate that there are currently many projects happening in the Ntabelanga area, mainly related to improved land management. It is important to keep clear communication with the role players of each project in order to integrate what is already available into the guidelines. For example, the concurrent WRC Green Village: Landscape Greening project refers to the WRC Green Village: Catchment Management Guidelines. The Catchment Management Guidelines could in due respect refer to innovative natural resource management strategies developed through the Landscape Greening project too. Dissemination of information is also important as the Landscape Greening project is following a more informal route than the Catchment Management Guidelines. These training sessions should rely on existing material where possible and have partnered with Fundisa for Change as they have proven successes in the region. Adult education should also be discussed further.

3 LESSONS LEARNED

3.1 AIM

The Lessons Learnt Framework was developed from a literature review of the many natural resource management-based projects that have been implemented across the country, and some international examples. There are a variety of factors which have contributed to the success or failure of each of these projects. These factors were integrated into a framework for reviewing the projects locally, nationally and internationally which have focused on natural resource management.

The purpose of the Framework was to review the available literature on natural resource management-based projects. The following are outcomes of this framework:

- Identify National Legislation and policy administering Natural Resources Management (NRM).
- Develop a database of NRM-based projects locally, nationally and internationally.
- Determine the success or failure, including reasons, and whether the project was driven by the community or through external parties.

3.2 REVIEW CRITERIA THEMES

This Framework focused on seven key management strategies, which are grouped into three themes as follows:

1. Policy
2. Management strategies
    2.1. Community based management
    2.2. Land based management
    2.3. Biodiversity based management
    2.4. Climate Change Adaption / Preparedness
    2.5. Integrated management
3. Guidelines

Policy acts as the overarching framework, which informs management strategies, with guidelines acting from the opposite spectrum by being informed by management strategies (Figure 3-1). Although at the higher level the particular management strategy is noticeable, at the grassroots level the distinction is harder to make due to the inherent overlap in many projects. An Ecosystem Based Approach (EBA) may be considered as the combined achievement of socio-economic benefits (including landuse), climate change adaptation and biodiversity and ecosystem conservation or resilience. The detailed outputs of each review are included in Appendix B.

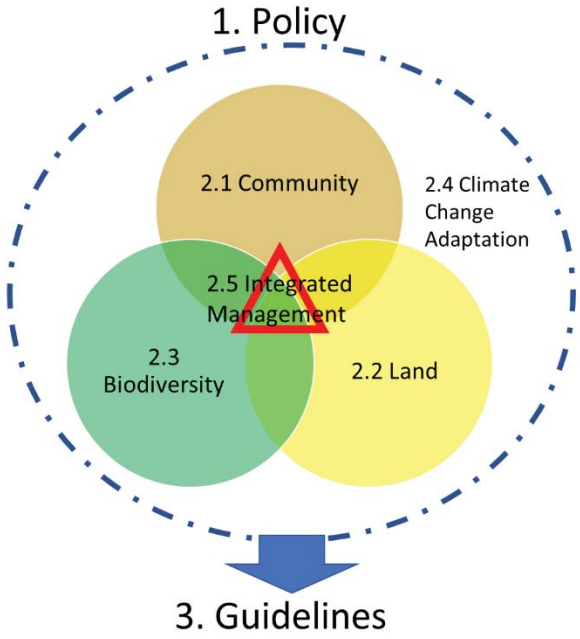

Figure 3-1: The interaction of different management strategies for NRM and CM

3.3 FINDINGS

3.3.1 Policy related to catchment management

There are three national Departments which have a mandate to manage South Africa's natural resources. These Departments have a different focus and, in turn, different management strategies when it comes to Natural Resources Management, which results in isolated rather than integrated approaches. DAFF has a focus on land, within the interests of the public for agriculture and forestry productivity; DWS has a focus on water resources, which demands an integrated approach; and DEA has a focus on the environment, which encompasses people as a part of the environment.

- *The DAFF focus has mainly been towards commercial forestry, with limited focus on communal agriculture. The programmes the DAFF runs which do focus on NRM usually involve supporting smallholder producers or revitalising irrigation schemes. Historically the DAFF has identified land management as a key area of concern in the Transkei, and various policies have prioritised soil and water management, with varied results. Although it was noted that land degradation was an issue of concern in this region, conflicting policies during the Apartheid era meant that land practices were not always effective and land ownership issues were as much to blame for the degradation as natural issues. The ARC seems to be more involved in "on the ground" activities of NRM, as they support and collaborate with various partners. The Research and Innovative Systems branch of ARC focus on both Soil, Water and Climate; and Mechanisations and Engineering. These research focuses have notable projects on the go which are providing innovative new methods to manage natural resources.*
- *The DEA focus has mainly been towards biodiversity conservation, with an increasing focus on climate change. The programmes the DEA runs which focus on NRM are usually through conservation, regulation and management tools, with the environmental programmes branch being involved in "on the ground" activities. The environmental programmes branch is involved in NRM projects and the "working for" projects, which have a significant focus on job provision. SANBI's "Science into Policy/Action" focus has also partnered with DEA, and other organisations, for NRM projects. These projects range from long term, multiple partnered*

projects to short term limited partnered projects. There have been many success stories within SANBI's projects, which would be useful to emulate.

- *The DWS focus has mainly been on service delivery, increasingly so since the DWS broadened its mandate to include sanitation. Although providing sufficient water supply and sanitation to all is a core driver for the DWS, it is clear that there is also an important focus on conserving water resources in order to safeguard future reserves. This has meant that the DWS has not only focused on infrastructure and delivery of services, but also on the management of water resources. In the former Transkei area this concept has run into issues as the severe lack of water supply and sanitation directly conflicts with the need to manage and conserve water resources. Within this area there is also a lack of scientific data with regards to the state of the environment, which limits the abilities of authorities to make informed decisions about water resource management. Future plans are to develop a proto-CMA for Mzimvubu to Tsitsikamma, but this process is in itself burdened by administrative and social issues as it requires a large amount of stakeholder involvement. "On the ground" projects for NRM have usually been co-ordinated through the WRC. Various projects are funded by the WRC, depending on the strategic needs of the country. Innovative, new ideas are filtered through the "Lighthouses", where flagship projects are piloted. This project fits under the "Green Village" concept, which promotes community involvement in the "green economy".*

It has been argued that national and provincial departments of the environment have struggled to implement effective NRM programmes, with the custodianship of NRM being unclear (Shackleton, 2009). Whilst DEA have a mandate to conserve biodiversity, as do the national and provincial parks agencies, these bodies focus on protection of biodiversity through a variety of land zonation and permit systems, as opposed to balancing that with encouragement and support for sustainable use (Shackleton, 2009). Community-based programmes may be present in policy documents, but are limited on the ground, and may in fact engage in displacement activities in order to wean participants off dependency on natural resources, rather than supporting and guiding the existing use of resources towards a sustainable basis as part of a diversified livelihood (Dressler & Büscher, 2008).

Limited capacity and financial resources have meant that most departments have to be strategic with what they actually do on the ground, with many responsibilities being delegated to lower levels of government. In the case of DAFF managing indigenous forestry this has meant that the focus has been on policing natural resources, as opposed to promoting sustainable use for improving livelihoods or poverty alleviation. DAFF's focus on agriculture has mainly been around the private farming sector, with an emphasis on livestock. Local government also has an environmental mandate; however, they lack the resources or skills necessary to manage commons. Few local municipalities mention ecosystem goods and services in their IDP's, yet when local communities lose access to a natural resource poverty levels are likely to increase (Shackleton, 2009).

The high level, political and administrative management strategies have been particularly influential in the Eastern Cape, where it could be said that they have surpassed natural factors in importance when considering the significant land-use and land cover change in this region (Fabricius *et al.*, 1996). Historically farming practices in the Transkei area involved mixed farming, which integrated production of livestock consisting mainly of cattle; crop production on one or more fields; and vegetable production in home gardens (Lent, Scogings, & van Averbeke, 2000). Settlement patterns meant that croplands and other natural resources were arranged nearby homesteads. State interventions modified these traditional settlement patterns with programmes such as 'Betterment Planning' involving the separation of land belonging to a community into residential, arable and rangeland. Dispersed homesteads were consolidated into a single village, with a single residential plot being assigned to each household. Usually fences were erected by the state to physically separate the different land-use categories from each other, and also to subdivide the rangeland into camps for rotational grazing and resting. These high stock densities have mainly been blamed for the severe land degradation in the area (Trollope &

Coetzee, 1975; Forbes & Trollope, 1991), but in reality, it is a combination of environmental factors such as steep slopes; an increase in rainfall intensity and magnitude; deforestation and inherently erodible soil which have contributed to land degradation.

3.3.2 Management strategies and guidelines related to catchment management

The review of policies provided the backdrop to the current status quo of the South African government's perspective with regards to natural resource management. It paints a picture of a lack of ownership of natural resource management, with many overlaps in different Departments. It seems that the actual "on the ground" projects are usually implemented through the "research" branch of the national Departments, and the success of a project usually depends on the level of community participation and external partners included. It is apparent that whilst policy may inform natural resource management, it is the innovative solutions and community relations which sustain and make a project a success.

Although most natural resource management and catchment management programmes are inherently community based, focusing on the community component leads to an understanding that in order to create projects that are sustainable it is important to engage effectively with the community from the start. This engagement requires an understanding of the local governance and existing institutions. Once a programme starts it is likely that through capacity building there will be conflicts, and that these conflicts will be ongoing. It is also important part of sustainability to allow stakeholders to take responsibility and make decisions from the start. Once a programme is finished monitoring will be necessary, and this monitoring can be conducted through the community if they are effectively enabled.

The key programmes being run by the DAFF and ARC are focused on Soil and Water Conservation, through LandCare, and Sustainable Agriculture, through the promotion of Conservation Agriculture. Although these programmes have been successful in other countries, implementation in South Africa has been slow and challenging. Key lessons learnt are the importance of developing ownership and responsibility for the strategy by landowners and communities, without this the project will not be sustainable. The top-down or employment opportunities approach is also not effective as this does not promote long-term sustainability. Introducing new concepts requires a significant amount of research and engagement, as well as pilot projects and demonstration plots in order to formulate the "best-fit" for every situation. This may require high levels of external training and capacity building initially.

The DEA, and associated institutions, have evolved to focus on a landscape approach for biodiversity management. This has been an effective and innovative approach which has required a range of partnerships across the public/private sector. Key lessons learnt have been the value of creating an enabling environment and developing a coordinated approach. This requires significant research and in certain cases evidence, through pilot projects.

Climate change has recently been recognised by the South African government as an important global challenge. Although currently there are many high-level policies being drawn up in the DEA, DAFF and DWS, the on-the ground projects are already being initiated across the country as case studies for climate change adaptation and mitigation. Before solutions to climate change can be proposed it is important to understand the environmental and livelihood functioning. It is then possible to identify key challenges which require innovative solutions. The ARC and DAFF are embracing alternative farming techniques but recognise the importance of developing pilot projects and implementation process.

Integrated management has been a challenge to implement due to the inherent complexities introduced when attempting to work at a system scale. Uncertainty is an increasingly important concern when trying to manage complex systems of interrelated natural resources, and in particular there may be many gaps in knowledge when working in areas with limited data such as in South Africa. In this regard it is considered useful to have tools and guidelines to help navigate through the complexities and uncertainties.

There are many guidelines and tools available in South Africa for natural resource management and catchment management, but these are scattered across different sectors and are mainly directed at implementers. There are far fewer "how to" guidelines, which individuals with limited education can

understand and implement themselves. Guidelines which have been useful are well formulated and simple, with a significant emphasis on shared stories and illustrations.

4 TECHNICAL GUIDELINES

4.1 ABOUT

One of the primary aims of this project was to compile a set of technical guidelines for rural communities, a comprehensive "How to" reference document that would enable communities to identify solutions and applicable techniques that they could implement without expensive consultants or external driven projects. The idea was not to reinvent the wheel but to draw on existing guidelines, both local to South African and other rural areas of Southern Africa, and consolidate them into one Guideline document that addressed different resource management issues and challenges in order build resilient livelihoods as the foundation for Green Villages. The first task involved collecting and reviewing existing South African guidelines. The second task was to structure and compile the Community-Based Catchment Management Guidelines, and fill in any gaps that were identified.

The objective of the guidelines is not just for resource management but for the overall sustainability of natural resources within the catchment. This means an integrated approach, as illustrated in Figure 4-1. The toolbox includes guidelines for management, conservation, rehabilitation and maintenance of natural capital in order to achieve resource sustainability, where:

- **Resource protection and sustainability:** *includes formal measures and actions to prevent harm and/or loss.*
- **Sustainable resource management:** *includes the process of dealing with or controlling things or people to ensure sustainable utilisation.*
- **Conservation:** *includes maintaining the constant total value of a physical parameter, i.e. ensuring it (parameter) remains constant while the system is subject to external influence*
- **Rehabilitation:** *includes returning an ecological function back to a functioning state, not necessarily pristine*
- **Maintenance:** *includes actively preserving a condition or situation*

Figure 4-1: Integrated nature of resource sustainability

4.2 REVIEW OF EXISTING GUIDELINES

Guidelines and tools have been developed as a resource for stakeholders to implement key NRM and CM strategies. These tools have been developed either as secondary products of larger projects, or as a primary product. The use of guidelines in South Africa has been varied, with a significant challenge being implementation once developed. The detailed review of the South African Guidelines are included in Appendix B.

4.3 COMPILING THE TECHNICAL GUIDELINES

The Guideline Toolbox is composed of two sections. The first section is more procedural-type guidelines. These address complex issues such as “What is catchment Management” and “How to compile a village-level catchment management plan”.

The second section comprises the technical toolbox with the detailed “How to…” guidelines for on-site implementation.

4.3.1 PART 1: Procedural Guideline Themes

These guidelines are procedural and planning guidelines. Before the physical implementation of activities can take place there is some planning required including obtaining appropriate authorisations and permits, and setting appropriate objectives for catchment management activities. These include:

a. South African institutional and legislative framework

Implementing various technical activities may require formal authorisations or permits, especially in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and the National Water Act, Act 36 of 1998 (NWA). This section outlines the potential requirements and recommends a streamlined process for obtaining these necessary approvals.

- **Where to start**

Before starting to implement catchment management activities one needs to identify what the problems are, what are the causes and impacts and what the objective of the catchment management activities are. This section provides suggestions how to identify the cause and effect of problems, and thereby how to identify what activities should be implemented, by whom, and where.

- **How to get the processed started**

Catchment management planning can be driven by external forces such as an NGO, NPO or a Catchment Management Agency, or it can be driven internally by members of the community. This section outlines how to get the process going and establishing a catchment management committee (e.g. Green Village Committee) to lead the process.

4.3.2 PART II: Technical toolbox

These guidelines are technical guidelines outlining “How to…” implement a particular activity. These guidelines were grouped into 6 Key-themes (A-F). A decision support system was developed in order to identify the most suitable guideline for the site or issue to be addressed.

A. SUSTAINABLE LAND PROTECTION

Soil erosion, deforestation, poor agricultural practices, loss of soil fertility, lack of runoff management and gully formation each contribute to the degradation of land resources with resultant impacts on the catchment both up and downstream. In order to reduce land degradation, mitigate degradation and implement sustainable land use practices, this section of guidelines provides technical guidance covering various aspects of sustainable land management. Implementing these techniques and practices will minimise the loss of topsoil (through erosion) and soils throughout the catchment will be protected and retained in place.

- **A.1 Communal land management**

  Not all land is privately owned, and therefore it is not simply the landowner's responsibility to manage, repair or maintain the land. Communal land includes grazing land, cultivation land as well as pathways, roads, and community properties e.g. schools, clinic, etc. Although the physical land management activities are the same for other land, the process to address hierarchy in tenure, and who is responsible for initiating and authorising activities on communal land need to be appropriately followed. These guidelines also provide some guidance towards this communal/tenure hierarchy process.

- **A.2. Rangeland management**

  The guidelines in this section provide techniques to ensure continuous yield of rangeland products while protecting and improving the basic rangeland resources of soils and water – which support plant and animal life. These include conservation and sustainable management practices which take into account natural features, and regulate the periods of grazing, the number of animals allowed to graze on a given range area, and intensity of use. These guidelines also include techniques to rehabilitate overgrazed lands.

- **A.3 Erosion and runoff control measures**

  This section of guidelines provides a number of measures to be applied in cultivated lands, roads and pathways in order manage rainfall runoff. By managing runoff erosion is minimised, infiltration of rainwater increased and water use efficiency improved. Reduction in erosion contributes to reduced siltation of watercourses downstream.

- **A.4. Gully management and sediment trapping**

  Unmanaged erosion rapidly turns sloping land into gullies with the loss of farming land and topsoil and threatens infrastructure including houses and roads. Preventive practices are the best way to control gullies. Where gullies have been formed, these should be rehabilitated to prevent further damage and degradation. This section of guidelines provides techniques for both gully prevention, and gully rehabilitation, for both hillsides/farms and roadsides.

- **A.5. Stream/River bank management**

  This section of guidelines present methods for the improvement of stream/riverbank stability where these are already suffering from erosion. Also demonstrated are ways and means of rehabilitating stream/river banks with buffers. These will contribute to the creation of a more manageable riverbank habitat that is beneficial to wildlife and at the same time manages the riverine zone, ensuring adequate river function through sediment control and water quality improvement.

B. SOIL FERTILITY MANAGEMENT

One of the most important natural resources is the soil. Healthy and fertile soils produce good yields of crops; whereas poor or degraded soils produce low and unreliable yields. Soil health is a function of rooting depth, nutrient fertility, structure, organic matter content, below-ground biodiversity and water holding capacity – all of which are related. Ensuring soils remain healthy and fertile requires a variety of management techniques including climate-smart farming practices and nutrient management.

B.1 Climate-smart agriculture practices

This section of the guidelines provides techniques for sustainable agriculture – which will contribute to improving the health of the soil by enhancing its physical, chemical and biological properties. Good soil health will produce higher and more stable yields. These techniques contribute to avoiding erosion and controlling rainfall runoff, by increasing infiltration of rainwater and water holding properties and thereby improving soil moisture. Climate-smart agriculture covers the principles and practices of conservation agriculture (CA) and Permaculture address natural farming techniques (rather than mechanised).

B.2 Nutrient management

Soil fertility is of fundamental importance for agricultural production. The guidelines in this section provide basic information on techniques which maximize the efficiency of nutrients and water use for better agricultural productivity. This improves and sustains soil quality for the future. These include compost techniques and natural fertilizers.

C. WATER STORAGE AND MANAGEMENT

Water is critical to life and to farming. Two key issues affecting water are: access to water, and managing water. Access can be improved through household or community storage of water and resource protection. Access to water is also improved through water efficiency, i.e. using the water wisely to make it last longer; and through recycling water. This section of guidelines provides techniques on water use efficiency and recycling, water harvesting and storage, groundwater and infiltration, small dams, and small-scale irrigation schemes. By improving access to water, water can also be managed more sustainably, which is beneficial both to the community and to the catchment at large.

C.1 Water use efficiency and recycling

This section of guidelines provides advice that will help to improve water management in agriculture. By improving water efficiency through suitable crop selection, proper irrigation scheduling, effective irrigation techniques, and using alternative sources of water for irrigation, it will be possible to increase water availability and make the water last longer. These guidelines also address point source protection of water collection points.

C.2 Water harvesting and storage

These guidelines will help to provide access to additional water by harvesting water (collecting runoff) and storing water. By harvesting water, farmers can increase the area they irrigate, grow crops in the dry season, and support livestock. Water storage at the household or village level improves access to water, and reduces the labour burden, by reducing the number of trips to boreholes.

- **C.3 Groundwater protection and Infiltration**

  This section of the guidelines provides information to improve groundwater resources in particular by the infiltration of rainwater into the soil, thereby increasing availability of water stored in the rooting zone and groundwater. Increased water availability in the rooting zone reduces dependence on surface water irrigation, and provides increased potential for cultivation during dry seasons. Increased groundwater feeds the spring and improves surface water flow lower down the catchment as well as the level of water in wells close-by.

- **C.4 Small dams**

  This section of the guidelines provides information to help the community to construct small dams to store relatively small amounts of water. Stored water means water retained in the catchment for as long as possible, thereby increasing the time for infiltration and groundwater recharge. This also helps to reduce flooding downstream, and allows for the productive use of otherwise “lost” water.

- **C.5 Small-scale irrigation**

  This guideline provides information on techniques for diverting water to irrigation schemes. Water can be used directly in the field, or to fill water storage structures from which supplies can be withdrawn.

D. NATURAL RESOURCES MANAGEMENT

Communities rely on natural resources to live and earn an income. Over utilisation leads to the depletion of natural resources. Therefore, natural resources need to be managed and utilised in a sustainable manner, in order to maximise the goods and services received from them, while still maintaining their function and production capacity. Natural forests, grasslands and wetlands are finite resources that must be managed sustainably; similarly, invasive alien vegetation can provide useful resources but needs to be managed to prevent uncontrollable spread. This section of the guidelines provides guidance on the sustainable and efficient management and utilisation of these various resources.

- **D.1 Forests**

  Forests are important to return moisture to the air through evapotranspiration, which then generates rain, as well as to stabilise soils with their root systems; they can also be rich in terms of biodiversity as well as stores of carbon. The guidelines in this section provide information and techniques for the sustainable management of forests both natural and plantation, for reforesting of areas where forests have been removed including the selection of beneficial tree species. Includes guidelines for seed collection, tree nursery establishment, tree transplanting, and natural forest management

- **D.2 Grasslands**

  This guideline provides techniques for sustainable grassland management and rehabilitation.

- **D.3 Wetlands**

  The guidelines in this section aim to assist communities to improve farming practices and grazing in wetlands for more sustainable utilisation and reduced impacts. However not all wetlands should be farmed, the guidelines also provide techniques for the conservation of wetlands, and construction of man-made wetlands.

- **D.4 Medicinal Plant Management**

  This guideline provides techniques for sustainable harvesting of medicinal plants.

- **D.5 Alien and/or invasive plant management**

  The guidelines in this section provides information to educate communities on the general approaches to sustainably manage invasive and alien plant species. Invasive alien plant species are a threat to water resources and water availability. By managing them and preventing their further spread, these plants can also provide useful resources and alternatives to rapidly depleting indigenous vegetation.

E. SUSTAINABLE HOUSEHOLDS

In order to ensure that catchment management activities and resource protection activities can be implemented, it is important that activities around the household, farm and village are also sustainable and of a high standard. These include activities such as basic money management, nutrition, farm management, sanitation management, energy, waste management and risk management.

- **E.1 Money Management**

  As a result of living day to day off the land, rural groups of people do not generally practice a culture of saving financially. It is difficult to inspire people and communities to take responsibility for their environment when they are poor and in debt. This guideline provides some ideas on money management principles. These are also important for income generation activities and grant/fund management for catchment management implementation.

- **E.2 Nutrition**

  Healthy families are happy families. A major contributor to health is good nutrition. These guidelines provide a summary of good basic nutrition and what to eat accordingly. By having good nutrition leads to reduced illness and more strength and energy, better attendance at school.

- **E.3 Plot management**

  The guidelines in this section aim to assist farmers with activities around the house and farm (plot of land) to improve sustainability, efficiency and resource availability.

- **E.4 Sanitation and Latrine Management**

  Good sanitation improves health and hygiene. Having a healthy family, community and village means there can be more productive labour and income generation. Good sanitation reduces illness and mortality rates and reduces contamination of available water resources. These guidelines set out and describe techniques to improve sanitation and maintain systems.

- **E.5 Energy, efficiency and alternatives**

  This section of guidelines provides instructions to build devices which promote the use of renewable sources of energy to generate electric power for use in the household, or community, as a replacement for the burning of wood or charcoal. These guidelines also promote energy efficient use and reduce the release of noxious gases that have adverse health and environmental effects.

- **E.6 Waste management (solid)**

  Litter and solid waste can contribute to the spread of vector diseases such as *E. coli*, e.g. rainwater trapped in thrown away plastic bags provides ideal breeding grounds germs, and other illnesses including contamination of water resources. Therefore, it is important to manage the disposal of waste both at the household/farm level as well as at the market. One of the best methods of waste management is to recycle or reuse waste products, e.g. cans, glass bottles, paper, cardboard and plastics can be recycled and/or reused, and organic waste can be used in compost. These guidelines give guidance to improved management of waste including ideas for recycling, upscaling, reuse of litter.

F. DISASTER PREPAREDNESS

Disasters and emergencies can happen anywhere and anytime. However, in areas where natural resources are degraded or where no disaster planning has taken place, the communities are more vulnerable to the effects of the disasters. Fires can damage and destroy houses, forests, crops and grazing land. Floods can cause personal danger to communities, and can also wash away good farming soil if there is no village-level emergency planning in place. Floods can cut off access to clean water supply, and contribute to the spread of illnesses such as cholera. Similarly, landslides and land collapse can threaten homes, infrastructure and culturally significant places e.g. cemeteries. These guidelines provide techniques for practical firefighting and dealing with landslides. The guidelines also provide information about health such as waterborne diseases – in order to implement the principles of Catchment Management and the various activities requires that the community members are healthy. These Guidelines also provide techniques for emergency planning to ensure preparedness for future disasters and emergencies.

- **F.1 Fire management**

  The guidelines on fire management present best-practice firefighting methods. The specific topics of each guideline range from surveying the area and forecasting fire behaviour, to planning and implementing firefighting. Guidance is given on how to make and use the tools needed to fight fires safely, as well as how to make firebreaks to defend forests from runaway fires.

- **F.2 Landslide and Land Collapse**

  Denuded land is prone to land/mudslides from heavy rains, similarly erosion dongas and gullies may lead to land slippage and land collapse (especially pipe erosion). These guidelines address how to mitigate landslides / collapse and how to address it if it does happen.

- **F.3 Health**

  The health guidelines focus on waterborne diseases and present simple ways to keep yourself and your family healthy and prevent further spread. General best-practice for keeping yourself safe from a variety of waterborne illnesses are described.

- **F.4 Emergency Response Procedures** (incl. Flood and Drought)

  These procedures provide guidance for communities on how to respond to a variety of emergency situations. Guidelines are given for dealing with both fast occurring, life-threating emergencies (for example floods), as well as for longer lasting events (for example droughts). Procedures to introduce an early warning system for flooding are presented. The guidelines focus on describing practical ‘on the ground’ activities that will help limit the impact of these emergencies on the community and their livelihoods e.g. how to / not to cross a flooding river.

The complete Guidelines are found in Volume 2 of this Project Report, with reference:

Braid, S.G. (2019). Green Village: Community-Based Catchment Management Guidelines. Water Research Commission. Report No K5/2508. Pretoria.

5 EDUCATION REVIEW AND CURRICULUM

5.1 BACKGROUND AND RATIONALE

In South Africa, the quality of education as a whole still remains a national priority. There are still a number of legacies that continue to impact on the basic education and training system, most notably in the achievement of quality education. Despite numerous efforts, many schools around the country are still poorly developed in the sense that the facilities may be inadequate, and large numbers of children are still affected by poverty related factors affecting their participation in schooling. Coupled to this, teachers have mostly been exposed to poor quality teacher training and teacher's knowledge and their ability to teach has become a central concern in achieving educational quality (Rosenberg, 2008).

The country is also faced with a number of sustainable development challenges, most significantly water scarcity, land degradation, loss of biodiversity and more. On-going land degradation of catchment areas is on the increase. The natural resource base particularly in communal areas is in decline. It is estimated that close to 18% of the natural land cover in the country has already been transformed (DEAT, 2008). Building capacity at community level for adaptation and sustainable livelihoods and lifestyles is also a critical challenge, particularly for those in rural areas who are most vulnerable to the impacts of social, economic and environmental risks (DEA, 2010; DST, 2010). Currently a poor understanding of sustainable development exists in schools, and teachers have little capacity for integrating these issues into teaching and learning. In general, teachers still have inadequate environment and sustainability knowledge themselves to lay the foundation for environmental learning in schools, nevertheless, to inspire youth to take up related careers and a sense of citizenship for sustainability. The need to improve South African teachers' knowledge and pedagogical content knowledge (capacity to teach) in environmental and sustainability still remains a focus. This is reflected in the Curriculum and Assessment Policy (CAPS), which requires teachers from a wide range of subject areas to teach new environmental content knowledge, values and skills (DBE, 2011). However, being the Department of Basic Education focus the improvement of basic capacities such as literacy and numeracy, inadequate attention is being given to this new knowledge area, yet essential for improving our nation as a whole. In any case, in the curriculum policy environmental content is embedded across the different subjects and grades of schooling, in line with the curriculum principle that seeks to ensure environmentally literate citizenry. The CAPS (DBE, 2011) is a content-referenced curriculum, also committed to active and critical approaches with structured delivery frameworks to learning, and with clearly defined, structural guidance for assessment leaving little room for adaptation by the teacher. The strong dominance on knowledge sometimes leaves the teacher to limit what they teach to what they are familiar with, failing to develop deeper conceptual depth and understanding of environmental and sustainability concepts, such as climate change, and leaving the learners with also a superficial conceptual understanding of the issue at hand. Similarly, teachers may not be adequately equipped with necessary pedagogical skills to assist their learners to engage with contested and complex knowledge, nor enthused to pursue creative ways of teaching as the priority is to follow the school curriculum designed and adopted by the school system which tends to be quite rigid. Assessment of environment and sustainability knowledge and approach is also a challenge faced by the teachers.

All the above points to the need for a coordinated and quality national environmental and sustainability teacher education and development programmes, such as Fundisa for Change, as an initiative to address the following systemic priorities:

- Promotion of quality education in South Africa
- Emphasis on subject knowledge

- Strengthen pedagogical content knowledge and assessment practices (knowledge, values and skills)

This project partnered with Fundisa for Change to further develop the curriculum, pedagogical content and teaching praxis with particular focus on water and catchments.

5.1.1 Policy Relevance

Broadly, the inputs of *WRC K5/2508 Green Village: Community-Based Catchment Management: Guidelines, and Learning* project, through its partnership with the Fundisa for Change programme, would respond to the following policy priorities:

- The Constitution of South Africa (RSA, 1996) enshrines the right of every South African citizen to an environment that is not harmful to their health or well-being; and it also secures the right to protection of natural resources for present and future generations. Section 24 of the Constitution, in the Bill of Rights, states that *everyone has the right:*

    a. *To an environment that is not harmful to their health or well-being; and*

    b. *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*

        i. *Prevent pollution and ecological degradation;*

    c. *Promote conservation; and*

        i. *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*

- From this Constitutional mandate developed the South African National Environmental Management Act, Act 107 of 1998 (NEMA) (RSA, 1998), which provides a legislative framework for a host of related environment and sustainable development policy that governs biodiversity management, waste management, coastal zone management, natural resources management, water resources management, alien invasive species management and many other issues relevant to sustainable development of the country. NEMA also introduces a people-centred orientation to environmental management, and places sustainable development at the centre of the country's approach to environmental management, which integrates society, economy and societal issues. Hence environmental education, which is a principle statement of NEMA, has tended to reflect principles and practices that are congruent with most international thinking on Education for Sustainable Development (ESD). Environmental management and education in South Africa also support human rights and social justice approach to environmental concerns, in response to former policies of disenfranchisement from land, the environment and natural resources during the apartheid era. NEMA also introduced a legal framework for governing sustainable development and provides orientation to all government departments to include sustainable development and integrated environmental management approaches in their operations. The NEMA includes a clause that emphasises the need to integrate environment and sustainable development principles into education and training. Under NEMA, South Africa also developed a National Sustainable Development Framework (NSDF) for South Africa (RSA, 2008), which requires giving attention to capacity building of youth for sustainable development in the country.

- The Medium-Term Strategic Framework (MTSF) 2014-2019 of National Government includes a strong focus on quality education, skills development, rural development, sustainable human settlements and the sustainable use of natural resources. Environmental sustainability as one of the intended outcomes (RSA, 2013). These issues are also included in Vision 2030, and in new Green

Economy plans, and the strategy for Climate Change Mitigation. These issues are also powerfully linked to poverty reduction, a social justice approach to sustainable development of South African society and economy, and the national system of innovation. These sustainable development objectives have their roots in the South African Constitution which includes a focus on poverty alleviation, equitable access to natural resources, sustainable utilisation of natural resources for present and future generations, and the right to an environment that is not harmful to health or well-being. However, to address poverty while addressing related new development challenges such as climate change, water scarcity, new energy futures, sustainable human settlements, loss of biodiversity and natural resources, and vulnerability to risk; urgent attention needs to be given to strengthening the skills and human capacity needed for achieving these development objectives. New development challenges such as climate change and water scarcity threaten to reverse development progress, and so emphasising the need for new skills and human capacity to address these risks.

5.1.2 Education Sector

Over the years, various programmes have attempted to 'include' environmental content in the South African school curricular as well as, supporting teachers and learners in undertaking environmental education activities; and even running teacher education and training of trainers' programmes across the country. The National Environmental Education Programme (NEEP), for instance, was oriented towards building system capacity for implementing this principle of the National Curriculum Statement (NCS) which required all schools and teachers to ensure that the relationship between a healthy environment, social justice, inclusivity and human rights was incorporated into curriculum and teaching and learning activities (DoE, 2002). The NEEP tended to concentrate in piloting models for the professional development of subject advisors at district level; than on formal teacher education programmes, although some teacher education clusters were established in which models and approaches to Environment and Sustainability teacher education were piloted. On the other hand, and running in parallel, the South African Eco-Schools Programme, implemented by the Wildlife and Environment Society of South Africa (WESSA), and linked to the International Foundation for Environmental Education reached more than 1000 schools in the development of 'sustainable schools' through whole school development and curriculum change approaches (Rosenberg, 2008). However, both of these programmes – the NEEP and the Eco-Schools programme have not been able to provide for a sustainable system of teacher professional development (or Teacher Education and Development) for environment and sustainability education in South Africa. The Fundisa for Change programme, through its partnerships, tries to make a significant systemic impact in teacher education in South Africa over and above what other environmental education initiatives have managed to achieve. It is for this reason that this project has explored the feasibility of a partnership with Fundisa for Change based on working together to further develop the programme's curricular, methodologies and supporting learning materials for the Geography subject collaboratively with a group of DBE Curriculum Advisors and teachers from the Tsitsa River Catchment area in the Eastern Cape.

Within this wider policy context that supports environmental protection and sustainable development, this project and in partnership with Fundisa for Change, will contribute to a sustainable teacher education programme, with a curriculum framework that can be operationalised at different levels of the teacher education system, and resources to support school-based praxis. Reflective practice of teachers is also informed by the following education sector policies:

- The 1995 White Paper on Education and Training (RSA, 1995) requires the integration of environmental education for sustainable development into all levels and phases of the education and training system. It explicitly states that integration of environmental education should adopt an active, integrated approach to teaching and learning.

- The National Curriculum Statement (NCS) (DoE, 2002) and the Curriculum and Assessment Policy Statements (CAPS) (DBE, 2011) requires teachers to integrate aspects of environment and sustainable development into almost all subjects. This policy framework requires that teachers attain the requisite knowledge and pedagogical content knowledge skills for integration of environment and sustainability concerns into the South African National Curriculum.

- The Higher Education Qualifications Framework for Teacher Education (DHET, 2011) requires teacher education institutions and programmes to foreground knowledge in their accredited programmes; this replaces previous norms and standards for teacher education, which were based on reflexive and applied competences. The Department of Higher Education and Training foregrounds different types of knowledge and learning, which include subject based knowledge, disciplinary knowledge, practice-based knowledge, pedagogical knowledge, and situational knowledge. This 'knowledge mix' has fundamentally transformed the structuring and content of teacher education qualifications in South Africa and is particularly significant, as all qualifications need to be re-oriented within this framework. The policy seeks to ensure that teacher education is of the highest quality, which includes issues of relevance and responsiveness to current and future knowledge demands in South Africa.

- The new '*Integrated Strategic Planning Framework for Teacher Education and Development in South Africa'* (2011-2025) prepared by the Department of Higher Education and Training and the Department of Basic Education (DHET & DBE, 2011) seeks to support continuous professional development of teachers to adopt new orientations and approaches, and to improve their subject content knowledge, pedagogical content knowledge, practice and situational knowledge through a recognized, accredited system of continuous professional development, and through systems that support the establishment of professional learning communities. This strategic planning framework commits to content-rich, pedagogically sound continuous professional development courses for teachers. To provide these, the DHET and DBE draw on available specialist knowledge of the specific focus areas, including expertise provided by NGOs and other specialist groups. District Teacher Development Centres are established, with associated professional learning communities to provide on-going professional development support for teachers.

- The UNESCO (2005) Education for Sustainable Development (ESD) programme seeks to improve the relevance and quality of teacher education, and ultimately through this the relevance and quality of the education offered to learners in schools. South Africa is a UNESCO Member State, and is also a signatory to the ESD Strategy for Sub-Saharan Africa, which commits government to integrating ESD principles and practices into the education and training system, including teacher education.

5.2 'WATER AND CATCHMENTS' IN THE CURRICULUM AND ASSESSMENT POLICY STATEMENT (CAPS)

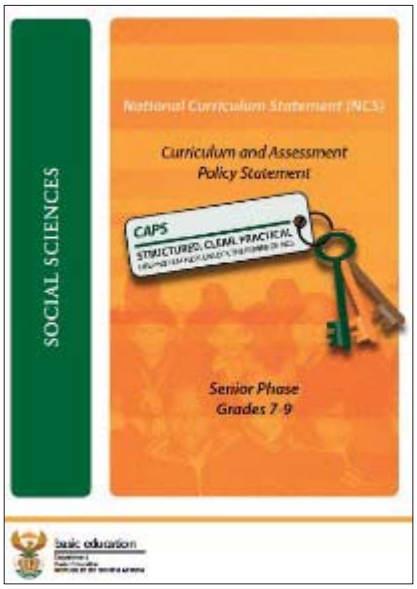

Figure 5-1: Curriculum and Assessment Policy Statement for Social Science Grade 7

The Social Science subject area presents itself as a relevant subject to integrate the 'water and catchments' focus into the school education system. There are other subjects where this environmental focus can be found or integrated but it will not form part of this study as they provide less relevance than the one found in the proposed subject (Figure 5-1). The Social Science subject area consists of History and Geography and these are required to be taught separately. In general, Geography is defined in the Curriculum and Assessment Policy as an "integrated discipline that examines both the physical and human processes over space and time. Geography helps to understand our complex world" (DBE, 2011:11 in CAPS). The 'water and catchments' focus is found already in the Geography curriculum, particularly in the Senior Phase (grades 7-9). The focus is linked to various interrelated themes, such as: i) Movement; ii) Human Settlements, iii) Human Activities, iv) Interdependence, and v) Change.

In summary, the first theme, *movement*, is described as understanding of how movement happens (and its causes) between people-food-water-air-land. This theme encompasses natural cycles such as the water cycle. *Human settlements* (where people live and why), as well as human activities (what people do and their effects on the environment) are also relevant themes where the concept of catchments and integrated catchments management can be explored. This subject area also opens up to consider the *interdependencies* found in complex systems such as catchments, as for instance; climate-vegetation interrelations, wildlife-resource distribution, as well as others. The remaining theme, *change*, looks into the changing nature of people and places (*Ibid.)*

The policy requires teachers to not only be familiar with the content in this subject area but also to 'read widely' on the topic. In other words, the teacher should have an in-depth understanding of the environmental topic at hand, meaning that the teachers' content knowledge should be broad so to be able to teach this topic with meaningful insights and not in a vacuum. The Fundisa for Change materials aim to expand the teachers' knowledge on specific environment and sustainability content knowledge in order to be able to develop quality lessons and activities with this type of 'new' knowledge. However, there are only three (3) hours per week (approximately 15 hours per 10-week term) allocated to teaching the Social Science-Geography subject area. In this subject area, learners are encouraged to think critically about the world they live in; develop a sound general knowledge of places and natural forces on Earth; understanding the interaction between society and the environment; care about the planet and the well-being of those who live on it; as well as being able to work with maps and different kind of data; and also be able to make more informed decisions and taking appropriate action with regards the topic under study.

From this project's aim, the Senior phase provides a good entry point to work with as the content knowledge and curriculum requirements allow for deeper engagement with 'water and catchment' related concepts and methodologies than earlier phases. The FET band has not been considered as it is usually more challenging to motivate teachers to participate in teacher education programmes, particularly in piloting new materials. A full description of the content knowledge embedded in the Geography subject for Grades 7 to 9 can be found in Table 5-1.

Table 5-1: Summary content overview – Geography Senior Phase

Term	Grade 7	Grade 8	Grade 9
1	Map skills (focus: Local maps)	Maps and globes (focus: Global and local)	Maps skills (focus: Topographic and orthophoto maps)
2	Earthquakes, volcanoes and floods	Climate regions (focus: South Africa and world)	Development issues (focus: South Africa and world)
3	Population growth and change (focus: World)	Settlement (Africa with a focus on South Africa)	Surface forces that shape the earth (Physical Geography)
4	Natural resources and conservation in South Africa	Transport and trade (focus: South Africa and world)	Resource use and sustainability (focus: World)

(Source: DBE, 2011:18)

The content and concepts for the proposed grades (7-9) within specific terms also confirm this approach. The following tables, Table 5-2 to Table 5-4; outline the content and concepts to the respective grades and terms chosen to work with for this project.

Table 5-2: Geography Grade 7 content and concepts with time allocation for Term 4 – Natural Resources and Conservation in South Africa

Content and concepts	
• **Natural resources**	**3 hours**
- Natural resources on earth – including water, air, forests, soil, animal and marine life	
- Use and abuse of selected examples	
• **Management of resources**	**5 hours**
- Concept of conservation – including reasons for conservation	
- Conservation areas (including marine reserves)	
o Purpose and location	
o Case study of a selected area	
- Community conservation projects – examples	
- Eco-tourism – examples	
• **Water in South Africa**	**4 hours**
- Who uses South Africa's water (pie graph of water users)	
- Availability of water and requirement in South Africa	
- River health and the care of catchment areas	
- Disappearing wetlands and why conservation is necessary – case study	
- Responsible use of water resources - agricultural, industrial and domestic users	
• **Revision, assessment (formal and informal) and feedback should take place on an ongoing basis**	**3 hours**

(Source: DBE, 2011:24)

Table 5-3: Geography Grade 8 content and concepts with time allocation for Term 3 – Settlements

Content and concepts	
• **Settlement and land use ***	**3 hours**
- Urban settlements	
o Land use within urban settlements – including the central business district, zones for light and heavy industry, residential areas (high-, middle- and low-income), shopping centres, services and recreation	
- Rural settlements	
o Types of rural settlement – including farming, mining, forestry, fishing	
• **Land use on aerial photographs and large-scale maps ****	**3 hours**
- What aerial photographs look like (oblique and vertical)	
- Information from aerial photos – natural and constructed features	
- Identifying land uses in urban settlements (aerial photographs and large-scale maps *)	
• **Investigation of a settlement (project) *****	**2 hours**
- An independent study of a settlement known to the individual learner	
o Describe the settlement and the different types of land use.	
o Identify specific features or landmarks (natural and/or human-made).	
o Suggest reasons for the location of this settlement ****.	
o Discuss decline and/or growth of population of the settlement and suggest reasons.	
o Identify and discuss one social or environmental issue.	
o Include interviews with community members, drawings, a sketch map and any other appropriate illustrative material.	
• **Urbanisation**	**5 hours**
- Concept of urbanisation	
- Why cities are growing – push and pull forces of migration (Africa with focus on South Africa)****	
- Overview of urbanisation in South Africa – including issues associated with apartheid population controls	
- Social issues related to the rapid growth of cities – such as housing and service provision (including health care and education)	

(Source: DBE, 2011:27)

Table 5-4: Geography Grade 9 content and concepts with time allocation for Term 3 – Erosion, deposition and Impact of people on soil erosion

Content and concepts	
• **Weathering**	**3 hours**
- Concept of weathering	
- Physical weathering	
- Chemical weathering	
- Biological weathering	
- Impact of human activities on weathering	
• **Erosion and deposition ****	**7 hours**
- Difference between weathering, erosion and deposition	
- Rivers – features of erosion and deposition along a river course	
- Sea – features of erosion and deposition associated with wave action: the power of wave action and typical landforms	
- Moving ice – features of erosion and deposition associated with glaciated landscapes	
- Wind – features of erosion and deposition associated with wind	
• **The impact of people on soil erosion**	**3 hours**
- Human contributions to erosion through agriculture, construction and mining	
- Case study: agriculture as a contributor to erosion	
• **Revision, assessment (formal and informal) and feedback should be done on an ongoing basis**	**2 hours**

(Source: DBE, 2011:31)

5.2.1 Teaching and Learning Support Materials (TLSM) for the Geography Subject Area

The Curriculum Policy Statement for the Geography subject area also specifies the resources needed in the class and available to the teacher. These include textbooks, maps and a globe, an atlas and dictionary as well as suitable visual materials. Additional resources such as DVDs, and where possible, Internet access to use, for instance, Google Earth. The policy also highlights the need for learners to work with maps of their own local area and other visual resources such as posters for at least one term of each grade. This aspect has implications on the development and provision of teaching and learning support materials (TLSM) in the Fundisa for Change teacher development programme as well as the WRC project itself. The required use and provision of (TLSM) should be considered when designing teacher education and development programme for the Geography subject area.

5.3 FUNDISA FOR CHANGE PROGRAMME

The following section offers a short overview of the Fundisa for Change programme and existing water related teacher education and training materials available to facilitate the programme's accredited course. A description about how these materials has been strengthened is also outlined.

5.3.1 Teacher Education programme with focus on Environmental Education: Fundisa for Change

Fundisa for Change is a collaborative national programme developed with the aim of enhancing environmental learning in South Africa through teacher education and development. The programme was established in response to the findings highlighted in the South African Environmental Sector Skills Plan, the Green Matter Biodiversity Human Capital Development Strategy, and the Global Change Grand Challenge National Research Plan Human Capital Development Strategy which pointed out that the foundations of environmental learning in the country requires further attention if the human capital needs in achieving long term sustainability goals were to be met (Fundisa for Change Programme, 2013). Over and above responding to the outlined national priorities, the programme also responds to the Department of Basic Education priorities through placing a focus on the environmental and sustainability education contents found in the Science, Geography, Life Orientation and Technology Curriculum and Assessment Policy Statements (CAPs) across the General Education and Training (GET) and Further Education Training (FET) phases (DBE, 2011) in a quest for improving the quality of teachers knowledge, and teachers abilities to teach 'new' environmental knowledge. This is supported by the Fundisa for Change programme through teacher education courses and facilitated with high quality learning materials and teaching modules. The Fundisa for Change programme's teacher education and development approach aims to build learners to become citizens capable of managing the national natural resource base, conserve biodiversity, build resilience to climate change, and ultimately building a green economy. In a nutshell, the Fundisa for Change programme claims that through a partnership-based high-quality environment and sustainability focused teacher education initiative, the following outcomes could be accomplished (Fundisa for Change Programme, 2013a):

- improve and expand the current quality and content of environmental learning in teacher education through capacity building;
- to influence and strengthen education policy and curriculum (and implementation thereof) to ensure adequate inclusion of environmental learning content in the schooling system;
- strengthen and expand a national network of providers and teacher educators and that they are willing to work together to achieve a national systemic impact;
- the programme will attract funding partners in its developmental stage; and over time become institutionalised within the national systems of funding teacher education.

Through a teacher education response, the Fundisa for Change programme primary aim is to: i) promote quality education; ii) enhance teacher's subject knowledge; and iii) strengthen teachers' pedagogical content knowledge and assessment practices. The consortium is working systematically within a national system to ensure longer term impact as learners in schools will potential develop deeper and broader knowledge of environment, biodiversity and sustainability to contribute to the management of South Africa's natural resources, a more sustainable society, green economies, and more climate resilient communities. The *WRC K5/2505 Green Village Catchment Management: Guidelines and Training* project, intends to add value to the Fundisa for Change programme by collaborating on aspects of teaching and learning support materials development with a 'water and catchments' focus and as a result enhance the teachers' capacity to teach these topics through a formal or informal education and training programme.

5.3.2 Teacher Education Materials Development

The Fundisa for Change teacher education and training materials were developed with deep understanding of the requirements and implications outlined in the content-reference curriculum (CAPS requirements) and the teacher education 'knowledge mix' required in the teacher education policy. The integration of environmental and sustainability knowledge into teacher education gaps have also been taken into account (e.g. the complex, new nature of the knowledge, as well as the dominant knowledge practices). As a result, the Fundisa for Change programme has developed a range of core materials and subject-specific units.

The mentioned materials were developed for the Fundisa for Change programme with the idea of providing exemplary knowledge resources, exemplary pedagogical content knowledge and assessment practice resources that could expand teachers' practices (Figure 5-2), and that could extend and challenge the trajectory of the dominant knowledge practices in environment and sustainability related education which used to be mainly orientated to 'put environment in the curriculum' rather than 'lifting and expanding' the environmental content knowledge already existing in the curriculum policies. A framework was developed for these exemplars or modules which consist of 'core' knowledge relevant across subjects for all subject teachers in all phases, and 'specific' knowledge relevant to specific topics / topic areas (e.g. Biodiversity or Climate Change or Environmental Health). Furthermore, the generic 'core' materials provide an orientation to the programme, and conceptual grounding for the subject specific topics. The core materials are: the introductory core text; methods and processes to support change-oriented learning; and framing active teaching and learning in CAPS (see Figure 5-3). These materials have already been edited and piloted and can be downloaded free from the Fundisa for Change website (www.fundisaforchange.co.za) for educational purposes with acknowledgements.

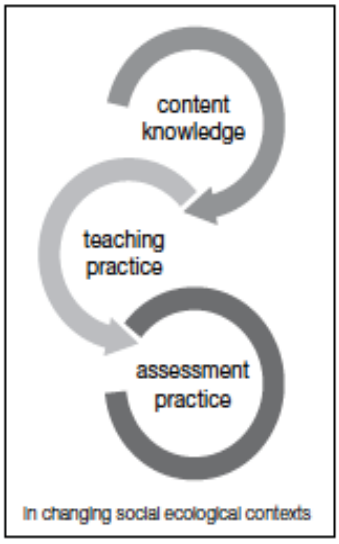

Figure 5-2: Fundisa for Change teaching materials Structure.

(Source: Rosenberg et al., 2008)

Figure 5-3: Fundisa for Change 'Core' Modules (Source: fundisaforchange.co.za)

The subject-specific topic modules or exemplars have been, and still continue to be developed to support teaching in the CAPS. These materials are designed to support specific schooling phases at the foundational (Grades R-3), intermediate (Grades 4-6) and senior (Grades 7-9) levels in the General Education and Training (GET) band, as well as the Further Education and Training (FET) band (Grades 10-12). Each module provides an orientation to a particular environmental learning focus (e.g. climate change, water, biodiversity, etc.), and it is also divided into three core areas as it relates to the environmental core knowledge, appropriate teaching practices and assessment practice.

The most relevant subject-related modules and environmental topics developed in-line with the K5/2508 project 'water and catchments' focus are the Social Science: Geography module for the intermediate and senior phases in the FET level. This project took the opportunity to re-work and expand the existing water-related Geography module for the Senior Phase, as recommended by the programme's coordinator and implementers. The decision to focus on the Senior Phase exemplars was further reaffirmed by the curriculum analysis undertaken. The material review process and outcome are further described in detail.

5.3.3 Endorsement and Accreditation

The Fundisa for Change teacher training programmes have been endorsed by the South African Council for Educators (SACE) and on completion of the required contact time, (40 hours over five days) and work away tasks (20 hours), teachers are able to claim 20 points towards their continued professional development. Further to this, the training programme or course, when facilitated in partnership with a partner High Education Institution, can be accredited at NQF Level 6. The endorsement and accreditation option are not only a reflection of the level of quality of the Fundisa for Change programme and its related teacher education courses and materials, but it also encourages teachers to undertake such training and learning opportunities as it contributes towards gaining professional development points.

Furthermore, the programme also responds to the Department of Higher Education and Training policy frameworks (see previous sections) that seeks to strengthen Professional Learning Communities (DHET, 2011) at local and district level. The Fundisa for Change programme, through their local and district implementation of the teacher learning programme, fosters the establishment and/or enhancement of existing Professional Learning Communities, especially when supported by the DBE district curriculum support staff and education district officers and other support partners such as NGOs and others.

5.3.4 Monitoring and Evaluation

The Fundisa for Change (FfC) programme has also compiled a Monitoring and Evaluation (M&E) framework which focuses on the following impact areas (Fundisa for Change, 2013):

- I*mpact area 1:* System development for environmental learning and teacher education in South Africa
  - Capacity Building: How and how well the Fundisa for Change texts are being used in an accredited/SACE endorsed programmes?
  - Policy and Advocacy: How and how well the Fundisa for Change training programme and materials are being integrated into the DBE and the DHET's systems of Teacher Education?
  - System of Engagement: How and how well are the HEIs using the Fundisa for Change materials?
  - Curriculum Review: How and how well textbook authors are integrating FfC materials and principles into textbook writing?
- *Impact area 2:* Teacher's knowledge and practice
  - How is the FfC programme improving teachers' knowledge?
  - How is the FfC programme improving teachers' practice?
  - What contextual factors influence teachers' engagement and success in the FfC programme?
  - Does this influence learner interest and learner achievement? (including interest in environmental and sustainability related topics and action)

The above key M&E impact areas with its specific system, teaching praxis and learner achievement foci provides a broad framework from which this project's outcomes have been evaluated through a case-study approach adopting a realist evaluation lens (see *Chapter 6*).

5.4 CURRENT CURRICULUM REVIEW

On 12th February 2018 a group of education and subject specialists held a workshop in Grahamstown in order to draft a framework for the review of the existing Fundisa for Change Water module for the subject and phase specified above. The meeting was held at the Environmental Learning and Research Centre, Rhodes University. The attendees included Conde-Aller, Laura (Rhodes University); Braid, Samantha (Waterlore); Fox, Helen (Independent); Lodenkemper, Louise (Aurecon); Misser, Shanu (Fundisa for Change); Rowntree, Kate (Rhodes University) and; Schudel, Ingrid (Rhodes University) with apologies from Yoyo, Sindi (Department of Education, Eastern Cape) – See *Appendix 7 – Water module review meeting notes*.

The original Fundisa for Change material developed in 2014 to teach water in the Geography subject area in the senior phase (Figure 5-4) contains a useful orientation and introduction section as well as one unit of teaching, with three activities suitable for use with Grade 7-9 learners. The aim of this task was to develop this resource further with additional units and activities, in order to develop teach capacity and confidence, and thereby improve teaching pedagogy of the subject. The original module starts by making an introduction to key water related concepts such as:

- The hydrological cycle or water cycle
- Catchment/drainage basin
- Integrated Catchment Management
- RAMSAR Convention on wetlands
- Aquifer
- Groundwater
- National Water Act
- Eutrophication
- Water, development and sustainability
- Access to fresh water
- A systems approach to understanding water
- Water supply is a close system
- Water pollution

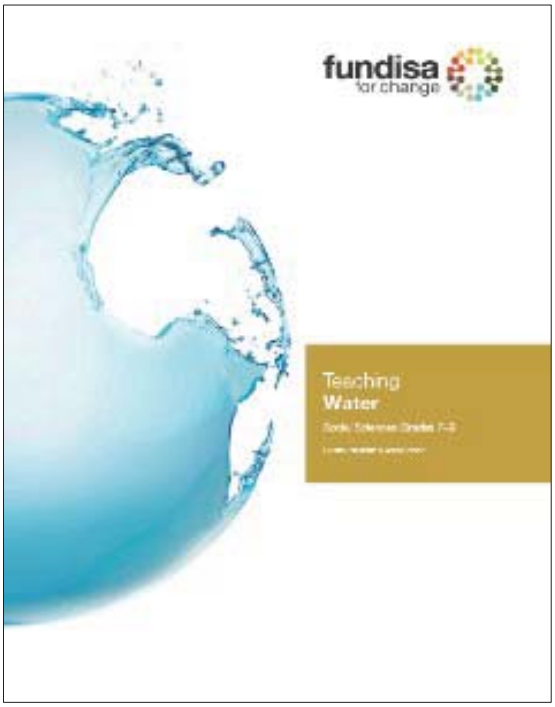

Figure 5-4: Fundisa for Change teaching water in geography senior phase unit.

The Water Unit previously developed is titled “People and Water” and intends to respond to the Curriculum and Assessment Policy (CAPS) requirements found in the mentioned subject area and phase. The text expands the CAPS subject content knowledge and key water related concepts as far as water availability in South Africa, water policies, Catchment Management Areas, Approaches to Catchment Management, Wetlands and Action Taking. The unit incorporates three main activities designed to assist teachers in carrying out the CAPS established content-referenced curriculum as well as methodologies and assessment approaches. The Fundisa for Change activities in this original material are:

- Activity 1: Getting to know your catchment
- Activity 2: Why do we need wetlands?
- Activity 3: Water Auditing

This water unit also provides a list of contacts and websites where teachers could access additional Teaching and Learning Support Materials (TLSM).

As part of the materials review process, gaps and opportunities for further development were discussed at the workshop. A detailed description of the topics identified by the reviewing group are presented in Table 5-5.

Table 5-5: Review of the Geography CAPs for Grades 7-9: Gaps and Opportunities in relation to the Water/Catchment Focus for teaching the CAPS++ curriculum

Grade	Term	CAPS Content, Concepts and Time Allocations	Method of Assessment	Gaps and Opportunities for teaching water and catchments (CAPS++)
7	1	Map Skills – Local maps 1: 50 000 (15 hours): • Local maps (finding local features) • Sketch map and explaining routes • Sketch map of local area (project) • Distance and scale • Current events (e.g. from news items or topic of interest to learner): place news on a world map, latitude and longitude of places	Project	• Project: Identify features on a catchment map 1:50 000 (e.g. course of river, forests, etc.). Sketch catchment of local area including land use and vegetation and show cardinal compass directions.
	2	Floods (4 hours): • Causes of floods such as heavy rain and environmental factors (e.g. loss of vegetation) • Effects of floods including displacement of people, soil erosion, damage to fields, building and infrastructure • Risks to communities • Reducing impact – mitigating measures • Case-study from this century in South Africa	Task/Test	• Early warning systems (floods) • Not only flood mitigation/response approaches but also include benefits of floods (e.g. flood irrigation) • Spatial aspect of flooding (link to Term 1 – local maps) • Climate change effects (e.g. higher levels and intensity of storms). Case-study. (Note: Why are floods covered before erosion is in the following grades? Need to make links back)
	3	World Population Growth (6 hours): • Patterns of world population growth from 1 AD to present day (interpreting a line graph) • Development that have affected population growth (e.g. increased food production, scientific developments, improved health care) (Note: Factors affecting birth and death rates)	Task	• Link availability of water to population growth • Reticulated water used to be available to the elite and now everybody is wanting demanding – look into water rights and on the ground reality (historical links) • Population growth. Where does water come from in urban and rural areas? • Link settlements to water availability and impact on resources • How is water used?
	4	Natural Resources and Conservation in South Africa (15 hours): · Natural Resources including water, air, forest	Examination (year-end examination 40%)	• Interdependence of natural resources • Management: need to understand catchment boundaries (link to map work

Grade	Term	CAPS Content, Concepts and Time Allocations	Method of Assessment	Gaps and Opportunities for teaching water and catchments (CAPS++)
		soil, animals and marine life (3 hours) · Management of Water and Resources (5 hours): Conservation, conservation area case-study, community conservation projects. · Water in SA: water users, availability and supply, river health and catchments, wetlands case-study and responsible use of water resources such e.g. agricultural, industry and domestic uses (4 hours) (Note: conservation and management of environment and natural resources is central. Sustainability is a focus in Grade 9)		grades 7-9) and up/down stream consequences • Water in SA: relations between water sources and settlements (also water transfer schemes) • Spatial and temporal elements of water supply (access) • Water access and equity (justices) and water rights in terms of socio-economic groups and urban-rural • Population growth and water demand (link to term 3): how are water use practices changing with development? • Gender issues with water and other social issues
8	1	Maps and Globes – Global and Local (15 hours) • Maps and atlases (latitude/longitude, indexes on maps, scales) • The globe (6 hours) (hemispheres, earth's rotation, time zones, seasonal temperature changes) • Satellite images (use and types of information such as water, vegetation and land use) – 2 hours	Task	• Integrate GIS (e.g. satellite images/Google maps) • Satellite images: information on water, vegetation, land use (refer to Google maps) • Hemispheres and impact on natural resources (north facing slopes and south phasing slopes). Implications on catchment characteristics.
	2	Climate Regions in South Africa and the world: • Factors influencing temperature and rainfall • Climate in SA and around the world (weather vs. climate, elements of weather, kinds of climate, kinds of climate such as tropical, subtropical, etc.; temperature and rainfall characteristics) (Note: use maps with climate regions, link climate regions with factors, rainfall and characteristics in your area)	Task/Test	• Climate Regions • What influences rainfall, patterns, etc. • What happens if any of this change? How variable is the climate? Link variability to vegetation cover • How about drought? (floods cover in grade 7) – SA a water scarce country. • Change of vegetation cover and impact of climate variability (This may be covered in the FfC CC module)
	3	Settlement (Africa with a focus on South Africa)	Project	• Project: investigation of a settlement looking at the urban layout but need to investigate

Grade	Term	CAPS Content, Concepts and Time Allocations	Method of Assessment	Gaps and Opportunities for teaching water and catchments (CAPS++)
		• Settlement and land use (urban and rural and land uses within these areas) • Land use aerial photographs and large-scale maps (oblique/vertical, natural and constructed features, identify land uses) • Investigation of a settlement (project) • Urbanisation including service provision		the natural resources of the settlement also. • Impact of settlement on natural resources. • What natural resources are required to support this settlement? • How about the resource economics of the settlement? (Note: Link back to water use discussions on grade 7) • Differences between urban and rural. • Water and food nexus. • Waste and water quality and availability. • Social issues including health care education and clean water • Urban and rural • Investment in Ecological Infrastructure
	4	Transport and Trade	Examination (year-end examination 40%)	Not relevant
9	1	Map Skills – Topographic and orthophoto maps (including the use of Google Earth, atlases and landscape models): • Contour lines including steep and gentle slopes, river valleys and spurs (3 hours) • 1:10 000 Orthophoto maps • 1: 50 000 Topographic maps (including natural and constructed features) • Interpret information form maps and photographs (describe landscape, identify land use and settlement patterns)	Task	• Spurs as catchment delineation • Slope and links to erosion and its relation to contour • Contour lines – relate to farming. A-frame technique for finding contours • Million's video on participatory mapping and modelling • Demonstrate run-off. E.g. Gutter-marble activity • Build a model with paper-mâché • Make a cake to make contours and poor acing • What does the teacher need to know? Spatial awareness and impacts of different topography (e.g. steeper slope, more erosion – revisit floods)
	2	Development Issues in South Africa and the world: • Meaning of development • Factors affecting development (e.g. historical, technology, education, etc.)	Task/Test	• Water justices • Rivers used as the boundaries in African countries and leads to a lot of problems • Historical factors such as colonialism • Malawi and Mozambique river boundary. Changes

Grade	Term	CAPS Content, Concepts and Time Allocations	Method of Assessment	Gaps and Opportunities for teaching water and catchments (CAPS++)
		• Opportunities for development (equitable, alternative and sustainable development. (Note: Critical interpretation of development is required. Provide examples of development programmes such as rural development and community-based initiatives. Take notice of the food production and farming focus covered in the term 4)		• SA water comes from Lesotho • Draught and development? Development changes e.g. Cape Town's challenges • Communities are working together in rural areas – sharing borehole • FAO national water base – link between development and water availability per capita. The more water, the less development because you don't need to work together and develop, therefore governance structure is not developed. Coordination is not needed. • The role of water and how water was managed historically. Roman water law. How was water management prior to colonialism? • Water wars?? Conflicts? Use of hydropower schemes in Uganda
	3	Surface forces that shape the earth (Physical Geography): • Weathering (3 hours) • Erosion and deposition (7 hours) • Impact of people on soil erosion through, for instance, agriculture, construction and mining. Include a case-study on agriculture as a contributor to soil erosion (3 hours) (Note: Use photographs of a range of land forms and topographic maps)	Task	• See weathering, erosion and deposition as transfer of material/sediment in a catchment. Link this to soil "creations", erosion, health (soil cycle). • Erosion – distinguishing natural erosion and human impact. Geomorphological process with people. Locate people in space and time. Add the human layer and how they modify the soil and not just contributing to deposition. (E.g. conserve the soil) • Not only agricultural, but land use practices as a contributor to erosion. How land use practices stop contributing to erosion. e.g. terraces to stop the good soil going into Egypt • Not only how people's land use practices contribute to erosion but how do they change soil through technologies, etc. and how these relations be developed in a more sustainable way. • Sediment can contribute to conflicts across countries. E.g.

Grade	Term	CAPS Content, Concepts and Time Allocations	Method of Assessment	Gaps and Opportunities for teaching water and catchments (CAPS++)
				the greatest export of Malawi into Mozambique is soil. • Look at catchment scale when looking at erosion deposition and the time scale • Impact of people on hillslope different to flat plains. erosion on the hillslope leads to deposition on the river • Creation of fertile flat plains. • Impact of nutrients in the soil and food security
	4	Resource and Sustainability in the World: • Resource Use (renewable and non-renewable, effects of unwise use of resources such as over-grazing) • Sustainable use of resources (sustainable/unsustainable resource use, sustainable land use for grazing, the role of consumers in choosing more sustainable resource use) • Food resources (food security, science and technology in food productions, sustainable farming (Note: critical studies of advantages and disadvantages of different modes of food production. Include case-studies to illustrate this concepts)	Examination (year-end examination 40%)	• Interdependence of natural resources. Natural resources aren't in isolation. If you impact one it can have a knock-on effect. • What are renewable and non-renewable resources? Is water renewable or non-renewable? Present a discussion in different contexts • Unsustainable use of resources. (e.g. cattle paths in the Ntabelanga area and/or silting up of hydropower in Malawi) • Time-scales and thresholds around renewability. Everything has a threshold • Link it to history – we are moving out of the abundance period and therefore need to use it wisely (Anthropocene) • Water law – anthropocentric over eco-centric. What are the legal implications from a sustainable point of view? Things are legislated and therefore a form of protection. (FET grades) • Examples: Malaria is a problem in Malawi. Malaria nets being used as fishing nets catching the juvenile fish and with over fishing and lack of re-stocking, Bilharzia is spreading into health impact. Cultural and indigenous practices … • Ecosystems services and resource use (link back to previous grades) • Waste and water pollution (including on oceans)

Grade	Term	CAPS Content, Concepts and Time Allocations	Method of Assessment	Gaps and Opportunities for teaching water and catchments (CAPS++)
				• Poor practices up stream can affect downstream on a massive national impact • Food resources: food security relates to natural resources. • GMO water resistant crops. • Link to sustainable farming keeping your water and soil on the land and depend on a renewable resource. • Appropriate technologies and farming techniques: grow appropriate crop • Commercial vs subsistence • Where is food coming from? • What kind of agriculture should be promoted? Take into account the type of soil, climate, people, etc. (FET grades)

As a result, the revised Water Module or exemplar was adapted and additional units developed. The intention was to avoid a 'fragmented' approach from topic to topic or even from grade to grade. A logical progression was adopted for deeper understanding of the complexity pertaining to the environmental and sustainability contentious 'water and catchments' issues. The Fundisa for Change revised materials also try to assist the teacher with the planning of a learning programme with a 'progression' approach. The module was further developed during the pilot course with feedback from participating teachers and DBE officials. The revised Water Module is stand-alone document to this report, and is also accessible from Fundisa for Change.

5.5 OUTLINE OF THE REVISED WATER MODULE FOR GEOGRAPHY SENIOR PHASE

'Water and catchments' units have been written to support teaching water and water resources in the senior phase (Grades 7-9) of the Social Science curriculum with focus on Geography. The units take a social-ecological perspective: they focus on water as it relates to people and the environment, in a space-time context. Also, important to note is that the CAPS set the minimum requirements for learners; these materials, however, are not intended as a learning aid or to replace the textbook but rather to enhance teachers' own professional development by adopting a CAPS++ approach to content in the CAPS. The units intend to support the teacher in order to: strengthen their subject content knowledge of water issues, enhance their teaching practice, and support learners with assessment practice.

The revised module starts with an introduction to water and why water is important; and builds on the original module with a total of four units. These units are:

1. Know your catchment
2. Natural Resources and Ecosystem Services in a Catchment
3. Settlements and Resource Use within Catchments
4. Catchment Sustainability

Each unit encompasses a series of activities. These activities do not necessarily follow the sequence of the CAPS. The most relevant connections to CAPS topics are indicated for each unit with more details provided at the start of each activity. Although 'water' as a theme fits more within the Geography part of the Social Sciences curriculum, the historical impact of water availability on settlement patterns and subsequent development are also important topics. Where possible, History has been interwoven into water and natural resource management issues. In summary, the CAPS include much content knowledge that is necessary to the understanding of water management and conservation, as well as the concepts pertaining to catchments and sustainability. Each unit is supported by a series of activities with the intention to make the connections between scientific and technical knowledge that to relate natural resources and human well-being interconnectedness as they interact in a catchment over space and time. The following sections provide a brief outline as to how each unit supports and links to the specific CAPS requirements for Geography in the senior phase.

- ***Unit 1: Know your catchment***

The first water unit, Table 5-6, focuses on identifying the main features found in a catchment and includes both the natural resources and the built environment with the assistance of local and global maps as well as other observation and interpretation skills. The activities are:

1. Getting to know your catchment (part 1 and 2)

2. Map the natural resources of your catchment (building on previous mapping activity)

Table 5-6: Unit 1 related topics within the CAPS and showing relevant Grade and Term

Key Concepts and Processes	Grade	Term
Local maps 1: 50 000 Finding local features Routes	7	1
Floods Causes of floods such as heavy rain and environmental factors Effects of floods	7	2
Global and Local Maps Latitude/longitude, indexes on maps and scales Seasonal temperature changes Types of natural resources	8	1
Topographic maps Contour lines Natural and constructed features	9	1
Surface forces that shape the earth Weathering Erosion and deposition	9	3

- ***Unit 2: Natural Resources and Ecosystem Services in a Catchment***

This unit focuses on renewable and non-renewable resources and expands these concepts by exploring the meaning of ecosystems services and their relationship to a healthy catchment, Table 5-7. The activities are:

1. Why do we need wetlands and what services do they provide?
2. How to make a model wetland

Table 5-7: Unit 2 related topics within the CAPS showing relevant Grade and Term

Key Concepts and Processes	Grade	Term
Natural Resources and Conservation in South Africa Natural Resources including water, vegetation, soil and animals Water in SA Wetlands	7	4
Resource and Sustainability in the World: Renewable and non-renewable resources Unwise use of resources	9	4

- ***Unit 3: Settlements and Resource Use within Catchments***

This unit focuses on settlements, their historical formation and characteristics and the impact of development (or lack of) on the settlements' natural environment and human well-being, Table 5-8.

The activities are:

1. Investigation of a settlement
2. Monitoring water quality
3. Case-study: Agriculture as a contributor to erosion

Table 5-8: Unit 3 related topics within the CAPS showing relevant Grade and Term

Key Concepts and Processes	Grade	Term
World Population Growth Development that have affected population growth	7	3
Settlement (with a focus on South Africa) Investigation of a settlement (project) Urbanisation including service provision	8	3
Development Issues in South Africa and the world Meaning of development Factors affecting development Opportunities for development	9	2
Surface forces that shape the earth Impact of people on soil erosion	9	3

- ***Unit 4: Catchment Sustainability***

This final unit focuses on resource use in social-ecological systems such catchments and introduces the concepts of adaptation and mitigation measures as a way towards sustainable catchment management, Table 5-9. The activities are:

1. SustainStability Game

Table 5-9: Unit 4 related topics within the CAPS showing relevant Grade and Term

Key Concepts and Processes	Grade	Term
Floods Reducing impact – mitigating measures	7	2
Natural Resources and Conservation in South Africa Management of Water and Resources Conservation	7	4
Resource and Sustainability in the World Sustainable/unsustainable use of resources Sustainable farming and food resources	9	4

The current version of the module is available as a separate report to this document, and is also available from Fundisa for Change.

The revised module was tested through a Case Study (chapter 6 of this report).

6 TEACHING CASE STUDY

6.1 INTRODUCTION

The Project collaborated with Fundisa for Change, an education NGO, to conduct the curriculum revision and training of the teachers. The Fundisa for Change programme aims to enhance teachers' environmental learning competency in teaching the 'new' environmental and sustainability knowledge found in the curriculum thus improving the quality of education in South Africa. Over the years, the Fundisa for Change programme has developed a wide range of environment and sustainability content related modules or 'exemplars' aligned with the Department of Basic Education (DBE) Curriculum and Assessment Policy Statements (CAPS) for a variety of subjects, including the Social Science (Geography) subject. Although units had been drafted for the Geography water-knowledge embedded in the policy, it was recognised that they needed further input. Therefore, as well-established teacher education programme in South Africa, Fundisa for Change, was identified as a suitable framework for the development and/or adaptation of curricular and learning material with focus on 'water and catchments' content knowledge and appropriate learning pedagogies. The WRC K5/2508 Catchment Management Guidelines project and team has aimed to strengthen the Fundisa for Change learning units and supporting learning resources by expanding the 'water and catchments' content of the existing teacher training materials to speak to the requirements of the Geography subject. In doing so, and through a teacher education programme such as Fundisa for Change, this project will be able to reach learners from primary to secondary school level, particularly the latter, through supporting teachers' ability to teach the 'new' knowledge and complex concepts, as well as some practical skills found in the environmental and sustainability field, e.g. integrated catchment management.

The Fundisa for Change programme is a national partnership programme originally established by the Department of Environmental Affairs (DEA), Department of Basic Education (DBE), Green Matter and Rhodes University among others. The programme responds to the national green economy skills priorities, recognising that investments in environmental learning school-based education establishes the foundations required to build the human capital needed in achieving long term sustainability goals in the country. Furthermore, the programme responds to the Department of Basic Education priorities in improving quality education in South Africa.

Further to this, the Fundisa for Change programme has been developed in partnership with Higher Education Institutions and therefore it is usually offered to teachers through these institutions at an NQF level 6. The programme is also endorsed by the South African Council for Educators (SACE) with twenty teacher professional development points on successful completion of the programme or course assignments. The accreditation and endorsement of Fundisa for Change is not only a reflection on the quality of the programme but it also creates an incentive for teachers to participate.

6.2 LOCAL CONTEXT: TSITSA RIVER CATCHMENT

The local context of this case study was anchored to the Water Research Commission Green Village project situated in the Tsitsa River Catchment (quaternary catchments T35A to T35M). The Tsitsa catchment encompasses the towns of Maclear, Tsolo and Qumbo in the Eastern Cape. The catchment has become a priority area for abandoned land degradation attracting government catchment restoration interventions, such as the South Africa's Department of Environmental Affairs: Chief Directorate Natural Resource Management (DEA-NRM) "Working For" programmes (e.g. Working for Water, Working for Wetlands, Working for Ecosystems, etc.). The Ntabelanga-Laleni Ecological Infrastructure Project (NLEIP), recently titled as the 'Tsitsa Project' – named after the main river that flows through this area; is a catchment scale rehabilitation and sustainable land use management programme funded primarily by the DEA in collaboration with the Department of Science and Technology (DST) and the Water

Research Commission (WRC). It embraces a large and varied group of research and catchment management partnerships and stakeholders, the WRC Green Village: Catchment Management Project being a contributor.

6.3 COURSE ADMINISTRATION

6.3.1 Selection of course participants

The Tsitsa River Catchment was identified as a suitable area to select teachers from for a number of reasons. Firstly, the catchment context allows for 'water and catchments' topics to be explored by the teachers in teaching the school Geography curriculum. The context lends itself to the teaching and learning of some key environmental and catchment topics such as natural resources, conservation and sustainability (e.g. water in South Africa); people, settlements and their environmental impact (e.g. land uses and environmental issues); surface forces that shape the earth (e.g. water run-off and soil erosion) amongst others.

Secondly, contextualisation of the curriculum has the potential to foster active learning activities in and outside the school and by doing so reaching out to the broader community-based actions and learning opportunities. Furthermore, the Tsitsa River Catchment also offers links to government catchment management and sustainability activities and initiatives such as the WRC Green Village project and the Department of Environmental Affairs Natural Resource Management (DEA-NRM), and Tsitsa project, formerly known as the Ntabelanga-Laleni Ecological Infrastructure Project (NLEIP).

Once the context area was established, the next step was to identify the relevant districts from which the teacher and education practitioners were selected. The Tsitsa River flows through the Elundini Local Municipality (Joe Gqabi District Municipality) and Mhlontlo Local Municipality (OR Tambo District Municipality) in the Eastern Cape (see Figure 0-1). In the Eastern Cape, it is not unusual to find that administrative areas do not align with the Department of Basic Education (DBE) areas of jurisdiction. In this case, the concerned DBE districts encompassing the Tsitsa River Catchment correspond to Qumbo District on the right banks of the river and Mt Fletcher on the left bank of the river.

Figure 6-1: Fundisa for Change case study administrative district. (Source: https://en.wikipedia.org/wiki/List_of_municipalities_in_the_Eastern_Cape)

A formal course participant selection was followed by working through the Department of Basic Education. To start with, the Fundisa for Change programme and proposed materials development through a pilot course was presented to the provincial Eastern Cape Department of Education for approval. Consequently, relevant district officials were proposed by the provincial curriculum advisors. The district officials recommended were thereafter briefed face-to-face and orientated to the commitments (such as course contact time) and benefits of the teacher education and training programme. This process was substantiated with a formal programme introductory letter, which was delivered by hand and emailed to the relevant provincial and district offices. The Fundisa for Change initiative was well received by the DBE officials as a programme that would not only enhance teachers practice in many different ways (e.g. environmental content knowledge; subject specific skills such as map work, etc.) but also as an opportunity for course participants to gain professional development points and formal accreditation.

On approval of the initiative by the DBE to go ahead, the course coordinator and DBE district officials decided that due to the course accreditation time commitment – five consecutive days; the most appropriate days to run the course was to start on a Wednesday until the Sunday after. In this way, participants would be able to attend school for the first couple of days of the week, set up plans, etc. before leaving their classes to attend the course. The Town of Maclear was chosen as a suitable central place to host the course. A suitable venue was identified in Maclear. The venue consisted of a comfortable conference room, accommodation and restaurant.

Having agreed on the way forward, the district officials commenced the teacher selection process by identifying suitable schools located within the Tsitsa River Catchment. The DBE officials proposed to approach schools that previously had participated in environmental education initiatives and programmes. Course application forms were delivered to the selected schools via their DBE subject advisors and district officials. Teachers from these schools formally applied to attend the course. On acceptance, teachers also requested formal approval from their supervisors or principals to be absent

from school during the course contact time. 12 teachers from the Social Science (Geography) senior phase (grade 7 to 9) were selected – 5 teachers per district; as well as, 1 DBE Subject Advisor per district.

List of participating schools from the Tsitsa River Catchment are as follows:

- Jenca S.S.S. (Qumbo District)
- Joubert Luidi S.S.S. (Qumbo District)
- Qumbo Technical High School (Qumbo District)
- Sulenkama S.S.S. (Qumbo District)
- St. Cuthberts S.S.S. (Qumbo District)
- Lower Esinxaku J.S.S. (Mt Fletcher District)
- Mbandla J.S.S. (Mt Fletcher District)
- Mqokolweni J.S.S. (Mt Fletcher District)
- Ngaxaza J.S.S. (Mt Fletcher District)
- Mbonisweni J.S.S. (Mt Fletcher District)
-

6.3.2 Course Logistics

The Fundisa for Change course took place in Maclear (Eastern Cape) from Wednesday 23rd to Sunday 27th May 2018 at the Alpine B&B. The course fees were calculated in-line with the Fundisa for Change requirements that are set to ensure the delivery of a high quality and professional capacity development opportunity for teachers. The course fee also factors the fees associated to the High Education Institution accreditation requirements (e.g. planning, co-facilitation, assessment, moderation and accreditation). Other costs were also included. These are: course materials and TLSM, educational field excursion, training venue, travelling costs, meals and after course support.

6.4 COURSE PROGRAMME

The Fundisa for Change 'teaching water and catchments' course was facilitated in partnership with Rhodes University Environmental Research and Learning Centre (ERLC) for quality and accreditation purposes. On successful completion of the course requirements and assigned work-based learning tasks, participants are provided with a Rhodes University certificate (NQF Level 6) and SACE endorsed professional development points (20 points). The participants were required to attend the full course (5 full days) and complete their course assignments for a minimum work-away time of 20 hours after the course. All 10 teacher participants and 2 district subject advisors attended the course contact time required. A five-day course programme was carefully crafted by the course coordinator and facilitators in a way that would meet the course contact time requirements and content knowledge necessary to teach the Geography senior phase curriculum. The programme was partially shaped by the structure or units, content and activities mapped out in the revised 'water and catchment' module. One full day was allocated to facilitate each unit. The final day (half day) allowed participants to work on their portfolio of evidence either in groups or individually. Additionally, the programme also allowed for different core aspects of the Fundisa for Change generic training course to be incorporated, as for example, working with the programme Core Modules on improving teaching methods (e.g. fieldwork, teaching games, etc.), assessment practice and others. Figure 0-2 represents a pictorial collage of the different methods incorporated in the facilitation of the course.

Figure 6-2: Teaching methods used in the Fundisa for Change course

Furthermore, the course was facilitated by three professionals specialised in specific content and skills required to improve teachers' professional development to teach the CAPS++ curriculum. Professor Ingrid Schudel of Rhodes University concentrated on the education aspects from a curriculum point of view; Louise Lodenkemper (Aurecon South Africa), a water resource specialist covered the specific subject related skills such as mapping; and Laura Conde (Rhodes University) facilitated aspects pertaining to social-ecological systems and sustainability. Quality presentations and worksheets were used to support each session and made available to the course participants as an additional information source that can be adapted and used in the classroom or other means of teacher education and training

6.4.1 Teaching and Learning Support Materials (TLSM)

Over and above the reworked Fundisa for Change module, additional Teaching and Learning Support Materials (TLSM) were provided or pointed out to the teachers to support the 'water and catchment' focus. These TLSM include catchment posters reflecting the main environmental issues found in a South African context. Examples of these are the posters developed as part of the *Windows of On Our World* series and *River Health* programmes. Together with educational posters, puzzles and games that have been produced with the intention of mobilising prior learning on catchment related issues. These materials also provide an opportunity to build on existing knowledge through either group discussions or individual learning by providing relevant information additionally to the visual material. A few examples of 'water and catchments' TLSM contextualised in South Africa can be found in Figure 6-3. Water auditing resources were also handed out.

Figure 6-3: Examples of 'Water and Catchments' Teaching and Learning Support Materials available in South Africa

Furthermore, an electronic copy of the WRC Draft Community-Based Catchment Management Guidelines and Toolbox, developed as part of this project, was provided. The guidelines main text covers key concepts and processes as it pertains to water and integrated catchment management in South Africa. This resource also offers a more practical, hands-on section or 'Toolbox' from where specific preventative and rehabilitation methods and techniques to land use and management can be found. The CAPS for the Geography subject area requires learners to engage in critical thinking and decision-making activities for a more sustainable world. These also include taking action in their local context. Some examples of relevant content found in the WRC Catchment Management Guidelines and Toolbox are as follows:

- Under “water use and management”, Rain Water Harvesting (RWH) methods could be brought in. Content and ideas from the WRC “Toolbox” could assist with this (Grade 7);
- Content associated to natural resource management and catchment management as it relates to wetlands but also forest, grasslands, medicinal plants, and alien and invasive plants may also be incorporated in the Fundisa for Change Teaching Water materials (Grade 7);
- The “settlements” content knowledge needs to be addressed in more depth in the Fundisa for Change Water Module. This topic is well developed in the WRC “Toolkit” with great schematics representing the cause and effect of land uses and degradation. In addition, the “Toolbox” section of the Catchment Management Handbook has an extensive list of sustainable land management practices in terms of preventing land degradation measures as well as rehabilitation methods and techniques (Grade 8).

The Fundisa for Change programme provides an opportunity for the WRC Catchment Management Guidelines to be adapted and incorporated into relevant activities within the modular subject-specific units revised and used to support the Geography subject area. The guidelines could also further inform the production of new activities and lessons and it will be up to the teachers to work with the material.

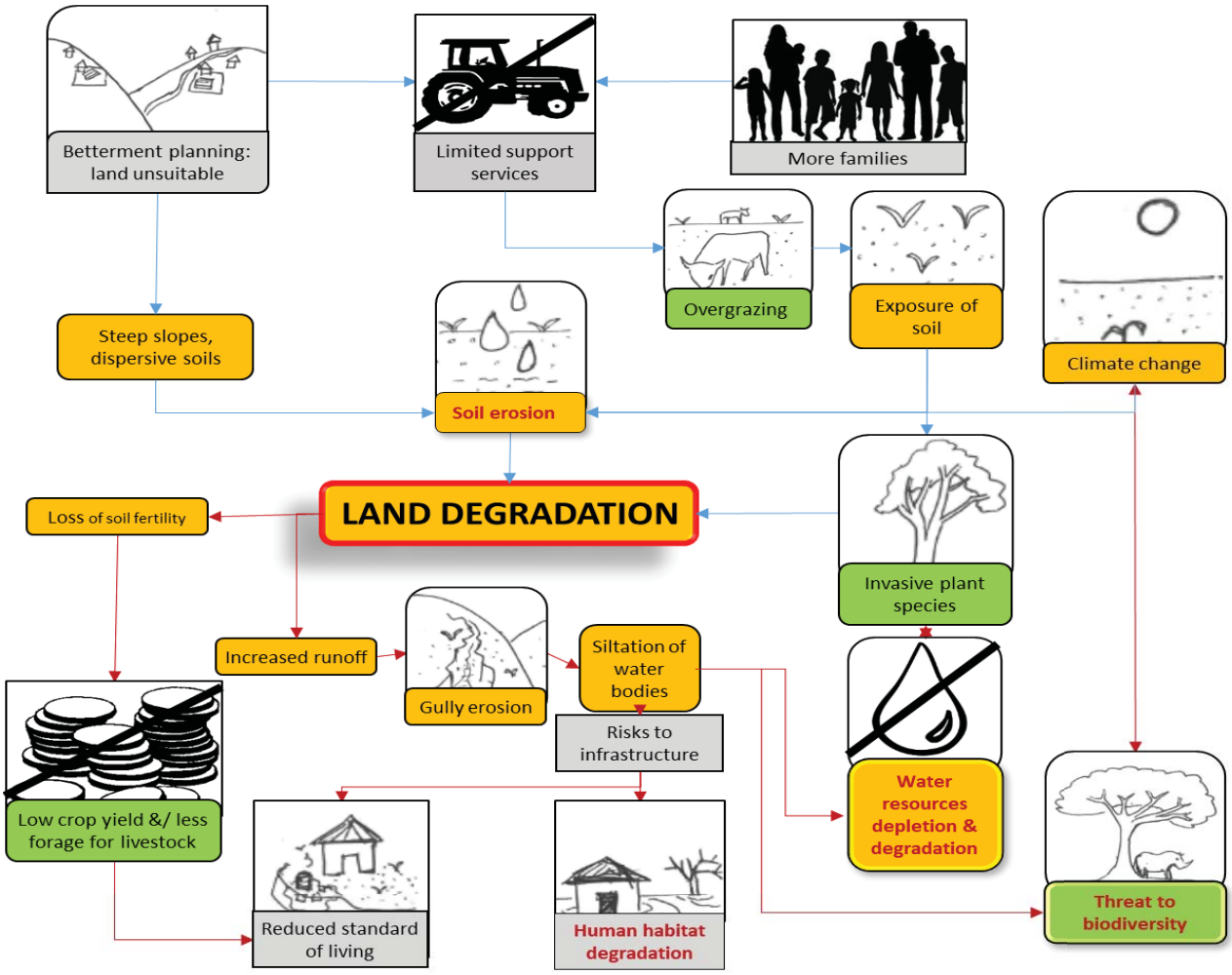

Figure 6-4: WRC Green Village: Catchment Management Guidelines schematic example on land use and degradation (Source: WRC Project K5/2508)

6.4.2 Portfolio of Evidence

In order to meet the NQF accreditation and SACE professional development points, course participants were requested to complete a Portfolio of Evidence (PoE) based on specific tasks aligned to their curriculum requirements. The tasks were designed according to specific learners' assessment requirements set up in the CAPS according to the Subject, Grade and Term. Table 0-1 below outlines the two assessment tasks set up for the teacher participants; an on-course task or lesson plan and a work-away task or lesson plan that the teachers had to implement in their schools as part of their Term 3 curriculum.

Table 6-1: Assessment summary of teachers link to CAPS requirements (on-course and work-away tasks)

Grade	**On-course Assessment Task**		**Work Assessment Task**	
Grade 7	PROJECT (term 1): Identify features on catchment map (Unit 1)	Identify features on a catchment map 1:50 000 (e.g. course of river, forests, etc.). Sketch catchment of local area including land use and vegetation and show cardinal compass directions.	TASK (term 3): World Population and Development (Unit 3)	Urbanisation and impact on natural resources • Patterns of world population growth from 1 AD to present day (interpreting a line graph) • Development that have affected population growth (e.g. increased food production, water availability in rural and urban areas and impact on health, scientific developments) and impact of settlements on water and natural resources. (Note: Factors affecting birth and death rates)
Grade 8	TASK (term 1): Maps and Globes – Global and Local (Unit 1)	• Maps and atlases (latitude/longitude, indexes on maps, scales). • Integrate GIS (e.g. satellite images/Google maps) • The globe (hemispheres, earth's rotation, time zones, seasonal temperature changes) • Hemispheres and impact on natural resources (north facing slopes and south phasing slopes). Implications on catchment characteristics.	PROJECT (term 3): Investigation of settlements (Unit 3)	Project: investigation of a settlement looking at the urban layout but need to investigate the natural resources of the settlement also. • Settlement and land use (urban and rural and land uses within these areas) • Land use aerial photographs and large-scale maps (oblique/vertical, natural and constructed features, identify land uses) • Urbanisation including service provision

Grade	On-course Assessment Task		Work Assessment Task	
		(Note: Satellite images – use and types of information such as water, vegetation and land use)		• Impact of settlement on natural resources. • Natural resources that support this settlement • Resource economics of the settlement • Investment in Ecological Infrastructure
Grade 9	TASK (term 1): Map skills (Unit 1)	Map Skills – Topographic and orthophoto maps (including the use of Google Earth, atlases and landscape models): • Contour lines including steep and gentle slopes, river valleys and spurs • Slope and links to erosion and its relation to contour • 1:10 000 Orthophoto maps • 1: 50 000 Topographic maps (including natural and constructed features) • Interpret information form maps and photographs (describe landscape, identify land use and settlement patterns)	TASK (term 3): Surface forces that change the earth (Unit 1 and 3)	Surface forces that shape the earth/Land use and natural resources: • Weathering • Erosion and deposition • Impact of people on soil erosion through, for instance, agriculture, construction and mining. • Include a case-study on agriculture as a contributor to soil erosion (Note: Use photographs of a range of land forms and topographic maps)

The education practitioners involved in the course were also requested to fulfil the NQF and SACE assessment requirements by also completing a PoE designed for their specific roles as subject advisors.

6.5 METHODOLOGY

The methodological approach outlined below was informed by the need to understand whether the envisaged outcomes of the course had been attained as a result of the environmental education teacher training intervention; but more specifically, the need to understand whether the mechanisms adopted by

such intervention (e.g. quality educational materials) triggered the envisaged outcomes in the context of the study. In other words, the role that context plays in making a teacher environmental education programme to succeed or not.

Based on the aim of this study, a case-study approach was embraced and findings analysed through a realist evaluation lens in order to illuminate the relationships or configurations between mechanisms-context-outcomes ('what works for whom in which circumstances') (Nielsen and Miraglia, 2017). The case-study involves 12 course teacher/education participants from the Tsitsa River Catchment. Contextual profiling tools, course participants Portfolio of Evidence (PoE), course evaluations, formal and informal reflections and observations were employed as main data gathering methods and tools.

Other appropriate methods such as in-depth interviews with the course participants and other stakeholders would have been recommendable in order to gain a better understanding of contextual barriers and enablers towards the intended outcomes of the programme. However, due to budgetary and time constrains, these have not been incorporated in the project research design.

6.5.1 Aim of the study and enquiry question

The aim of the case study was twofold. On the one hand, the intention was 1: to understand to what extent the intended outcomes of the course have been met, and on the other hand, to search for more depth and insight in understanding; and 2: how the outcomes of the course, through a teachers' education and training intervention, have been shaped by the context in which the initiate was undertaken.

Fundisa for Change course or intervention facilitated for the case study, adopted the specific outcomes proposed by the original 'Teaching Water' course. These were slightly moulded to meet the realistic expectations that this project afforded to support. The intended outcomes of the revised 'Teaching Water and Catchments' course were as follows:

- To achieve transformative environmental learning through teacher education.
- To develop foundational knowledge and subject specific knowledge on Water.
- To develop subject specific pedagogical content knowledge linked to teaching Water.
- To support and foster subject specific assessment practices of quality on Water.
- To develop transformational curriculum leadership, focusing on the "3S": pedagogy, which deepens subject knowledge; self-development as a teacher, and social learning.
- To develop reflexive scholars and citizens that can practice in social transformation.
- To support an open, critical approach to knowledge.

The study contributes to the Fundisa for Change programme Monitoring and Evaluation *Impact area 2* – Teacher's knowledge and practice:

- How is the programme improving teachers' knowledge?
- How is the programme improving teachers' practice?
- What contextual factors influence teachers' engagement and success in the programme?

6.5.2 Case-study approach: A realist evaluation lens

The case study was interested in understanding the role that an environmental education and training intervention plays on the improvement of teachers' practice from the Geography subject in teaching water, catchments and sustainability. The study recognised that in order to understand how teachers' practices change and improve (or not) it required an in-depth and explanatory description of the complex social phenomena in real life context. A case-study approach was therefore well suited as a technique that is capable of providing a detailed, nuanced and holistic observation of the phenomena (Durrheim, 1999) while understanding that the boundaries between the phenomena and its context are not distinct (Yin, 2009). In other words, Oosthuizen *et al.* (2007:71) defined a case-study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used".

On the basis that a case-study is a bounded system to a specific class of phenomena (Oosthuizen *et al.*, 2007:72), it is frequently argued that the findings and conclusion from case-studies are difficult to generalise, therefore a case-study should not seek to achieve representativity (Merriam, 1988). However, Flyvbjerg (2006) argued that although one cannot generalise from a case-study, it seems more useful to aim for generalising hypothesis rather than hypothesis testing and theory building. Flyvbjerg (2006:235) suggested that "the advantage of the case-study is that it can *close in* on real-life situations and test views directly in relation to phenomena as they unfold in practice". On the contrary, critical realists propose that it is possible to generalise from case-studies at the level of mechanisms and structures (Danermark *et al.*, 2002). This argument is supported by Greenhalgh (*et al.*, 2015) who also argues that realist evaluation interventions cannot simply be transferred from one context to another as outcomes maybe context specific. However, in-depth understanding of 'what works for whom under what circumstances' is transferrable (Greenhalgh *et al.*, 2015).

By adopting a realist evaluation approach to the analysis of the proposed case-study, one would be able to advance the theoretical understanding of which elements of the Fundisa for Change intervention may be effective and in which conditions positive outcomes may be expected, in other words; to gain insight on how to improve existing interventions and inform future interventions, while also ensuring internal and external validity (Nielsen and Miraglia, 2017). On the basis that this study aimed to understand the influence of the course participant's context and Fundisa for Change course process on the outcomes of such intervention, the lessons learnt from this case-study and the recommendations drawn up from such analysis should be transferrable to similar contextual phenomena in South Africa.

To conclude, realist synthesis builds on the principles of realist evaluation by focusing on CMO (Context-Mechanisms-Outcomes) configurations. "Realist synthesis in organisational intervention research would synthesise the mechanisms of the content and the process of the intervention and identify how participants' reaction (both cognitive and behavioural) shape the interventions' outcomes and in which contexts these mechanisms may be triggered" (Nielsen and Miraglia, 2017:56). Realist evaluators also claim that the impact of an intervention, such as the Fundisa for Change course, cannot be determined without understanding the impact of individual perception and behaviours on the success and achievement of the intervention's intended outcomes (Blamey and Mackenzie, 2007). It would be naïve to analyse the Fundisa for Change course in relation to the participants' context and the change in their practice (or lack of) without taking into consideration the teachers' choice in improving their practice and their agency to do so (Nielsen and Abilgaard, 2013).

6.5.3 Unit of analysis

The unit of analysis of this case-study encompassed the Fundisa for Change programme 'Theory of Change' in practice. That is, how the programme theory has caused change on the course participants selected from the Tsitsa River Catchment. The focus is not only on the programme outcomes but also on whether the programme mechanisms informed by the programme theory have worked or not (Greenhalgh *et al.*, 2015) towards the enhancement of teachers practice and environmental literacy. A

programme theory can be seen as an implicit set of assumptions that steers the choice and design of an intervention (Pawson, 2013) and spells out the coordinated sequence of activities (e.g. preparation, selection, action planning, implementation and evaluation) in interventions that are thought to be necessary to achieve the intervention's intended outcomes (Manzano and Pawson, 2014). In summary, the Fundisa for Change programme claims that through a partnership-based high-quality environment and sustainability focused teacher education initiative, the improvement and expansion of the current quality and content of environmental learning and quality education will be attained (Fundisa for Change Programme, 2013a).

These assumptions were examined in this case-study. Due to financial limitations, a single case-study was considered. The 10 teachers and education participants involved in the programme's 'Teaching Water and Catchments' course for the Geography subject area senior phase were selected from the Tsitsa River Catchment area via the Eastern Cape Department of Education.

6.5.4 Methods

A case-study allows for different data collection and data analysis methods to be employed (Oosthuizen *et al.*, 2005:74). In this case a qualitative research methodology was suitable to describe the contextual phenomena explored in relation to how the intended outcomes of the Fundisa for Change programme were fostered or not. The data gathering tools were informed by the formal teacher professional accreditation requirements and adhered to the National Qualification Framework and Rhodes University demands. A Portfolio of Evidence (PoE) was developed to gather the necessary data to meet the accreditation requirements as well as to meet the enquiry data gathering needs for this study. Data was analysed from the teachers' PoE and from the subject advisors one. The PoE incorporated other data gathering tools such a teacher and school contextual profile and guiding reflection questions. The PoE included the following sections:

- *Section 1: Supporting Documents*

  These are contextual profiles that gave insight into the teaching and community contexts of the participants. The documents in this section were not assessed but they were intended to help participants and researchers to reflect on the context in which participants are working and implementing the course.

- *Section 2: On-course Assessment Tasks*

  These were a series of tasks where participants demonstrated their subject knowledge, and knowledge of teaching strategies and capacity to conduct quality assessments of their learners' work.

- *Section 3: Work-away Assessment Task*

  Here teachers were requested to develop a follow up workshop plan or lesson plan for deepening/extending what was done during the course, for implementation and reflection.

At the start of the course, participants completed a knowledge test with the intention to establish their environmental and subject specific prior knowledge. The same test was completed at the end of the course in order to assess how, and if, their environmental and water specific content knowledge had improved.

In addition, a Course Evaluation Form was handed out to the course participants at the end of the programme so as to gather their reflections on how they felt the course assisted them to improve their practice, environmental knowledge, skills, etc., as well as an invitation for suggestions on how to improve the programme, more specifically, the Fundisa for Change "Teaching Water and Catchments" course for Senior Phase Geography.

6.5.5 Reporting Ethics

This study, from document analysis, empirical data gathering and analysis to report write-up on findings, has been conducted in a responsible manner and adhered to ethical standards in research practice. Bassey's (1999) respect for truth, respect for democracy and respect for persons is useful for thinking about ethics in this study. These include, but not limited to, responsible acknowledgement of ideas, informed consent and respecting the rights of participants, maintaining democratic relationships with participants, and reporting truthfully without fudging data (Bassey, 1995; Wassenaar, 2006). Since much of the data has been generated through formal portfolios of evidence designed to collate participants' teaching practices and reflections, their data has been handled with respect, dignity and privacy. As sensitive information has been generated, informed consent and confidentiality has been considered (Cohen, Manion, & Morrison, 2000).

Therefore, before the start of the Fundisa for Change course, participants were informed about the purpose of this study, the intended use of its results, potential consequences of the research, and who would potentially benefit from this study. Informed consent was gained in writing from each participant. Confidentiality and anonymity have been guaranteed on request. Permission to record discussion and presentations during the facilitation of the course has been sought before the start of each session. The use of a recorder and camera has also been granted on the basis that participants could request the recording to be turned off at any time, or even stop their participation. The results of the study have been reported back to the participants via their district officials.

6.6 SUMMARY OF FINDINGS

A realist evaluation seeks to answer the question of what works for whom in which circumstances. As much emphasis should be placed to understand what makes the Fundisa for Change achieve its goals and outcomes; it is also critically important to understand the context in which these may be triggered (Pawson and Tilley, 1997). In other words, what are the conditions in which an intervention is effective; and if not, what could be the contextual barriers. Macfarlane *et al.* (2011) analyse the context at four levels: the individual (e.g. values, roles and knowledge); the interpersonal (e.g. communication, collaborations and networks); the institutional (e.g. informal rules, organisational culture, leadership and regulations); and the infrastructural (e.g. political support). The four levels of context have been used in this study to frame the participants' overall school and community contextual analysis in which they practice or teach. The following *Section 5.1* offers a summary of the participants' context, followed by specific findings compiled from their Portfolio of Evidence, knowledge test and course evaluations.

6.6.1 Brief summary of course participants' context

In this section the local context is painted in which course participants are situated. This context requires to be understood within the backdrop of quality education in South Africa, teacher professional development policies and the national green skills agenda promoted as a way to tackle countrywide economic development goals and biophysical environmental improvement (see *Section 6.2* above). The following sections are summaries compiled from the course participants' contextual profiling questionnaire submitted as part of their Portfolio of Evidence.

Teachers and education practitioners' professional environment:
In general, the course participants indicated that their workload is demanding and often feel overwhelmed. This is mainly due to the fact that they are required to teach across multiple grades and various subjects – more than seventy per cent of the participants teach between three to six grades. At times, teachers also handle multiclass teaching; this means that, for instance; Geography is taught in a class with multiple grades with learners learning at multiple levels in most likely an overcrowded classroom. Over and above the practical challenges, teachers also confront a mixture of problems that directly affect their learners. For instance, learner substance abuse is not uncommon in the schools;

and learner dropout rates are also uncomfortably high. The socio-economic makeup of the area plays a part on these, as poverty and unemployment rates are discouraging. Most families depend on social grants and struggle to provide for basic material needs such as school uniforms. Some learners are orphans or looked after by their elders or carers in households with a great number of dependents.

Learners' academic performance:

Nevertheless, according to the teachers, learner performance is average or satisfactory. Although, the teachers recognise that most learners lack general knowledge perhaps due to the lack of exposure. It seems that being able to contextualise learning helps with their performance. As a result, learners tend to do well in some content and concepts of Geography and not so well in others. For instance, learners achieve better results in curriculum topics such as settlements as they can relate them to their day-to-day life; but they do not do so well in map work and physical geography (forces that shape the earth). Over and above these, leaners also find difficult to critically engage with environmental and sustainability aspects. Generally, learners struggle to participate in discussions and critiques, as it requires critical thinking ability and knowledge competency. This is evidenced by the type of assessment tasks that they enjoy or dislike. Low order questions such as match true or false and multiple-choice questions are the preferred options. Other medium and high order questions are by far the least popular among learners. This may be as a result of a low culture of learning, reading, writing and lack of creative thinking in the learners' family environment. Computer skills are also absent in the learners' academic environment.

Teachers' academic and environmental learning background and interest:

Half of the participants hold a Bachelor's degree in Education and the other half are awarded with a Senior Teaching Diploma. Most teachers involved in the study had a minimum of ten to twenty years of teaching experience. The others have been in teaching for at least two to three years. There were more male teachers than female ones.

Despite their qualifications and experience, teachers are expected to continuously improve their teaching practice by attending professional development workshops organised by their district supervisors or subject advisors. Workshops are offered to, for instance, address the 'content gaps' for Geography. Some of these workshops cover environmental related topics. The participants also revealed that at times they take their own initiative to access new information in order to teach the subject better. Some teachers have access to Internet and look for relevant teaching materials elsewhere. All teachers acknowledged that map work (analysis and interpretation) is a challenge for them. As per environmental knowledge in the Geography subject, they feel most comfortable with aspects that relate to water management and conservation as well as soil erosion and resource management in general.

Teachers' professional networks and support with environmental education initiatives:

Some schools seem to have developed a network of environmental education practitioners through their participation in local and provincial Environmental Education (EE) competitions. These are mainly linked to the Department of Water and Sanitation Youth Water Prize and/or the Department of Environmental Affairs competitions (annual environmental calendar days such as Arbor Week).

Participation in school environmental activities:

Within the schools, some environmental education activities (e.g. water conservation and food gardening) form part of the schools' routine. However, it is not clear how these activities are educational and contribute to foster learners' environmental value. The citations found below raise some questions in this regard:

"We have water tanks. We allocate grades as to which taps to use, then we observe flooding around those taps, then we award grades that used water well" (S Sokuto, Lower Esinxaku J.S.S).

“[The principal] always ensures that learners have easy access to cups so as to not drink from the taps with their mouths. She also ensures that each phase has an environmental club that does rounds around the school ensuring cleanliness" (S Sokuto, Lower Esinxaku J.S.S).

Teachers’ institutional context:

It is evident that most participating teachers have some environmental education background, perhaps a decisive criterion in the selection process. The schools that have participated in environmental education competitions seem to have been encouraged and supported by their principals. At times, the School Governing Bodies (SGBs) get involved in supporting environmental projects such as water management and food gardening. But more often than not, SGB and community members do not get involved in such activities. This may be because of their physical constrains, family commitments, or simply because they are not interested in environmental matters and do not share the same environmental ethics. The latter is reflected by a course participant in the following statement: "I remember saying to them [school community] they shouldn't burn the field or pastures. They replied that they need a new green grass for their animals forgetting about soil erosion".

Infrastructural and environmental context:

Over and above the many challenges outlined above, the course participants recognised that access to adequate knowledge resources is limited. Most schools do not have access to libraries nor Internet facilities, and even at times, the electricity is cut off. Teachers tend to rely on other sources of information, such as television programmes or searching the Internet on their cell phones. Thereafter, information sheets and hand-outs are compiled for their learners. Occasionally, some support is offered by local and provincial government departments in the form of environmental education booklets and posters. Most participating teachers pleaded for more subject specific and environmental content workshops and TLSM. This is reinforced by one of the participants:

“We are living in this changing world, with climate change and environmental change, so more workshops would help the teacher to be more capacitated" (*Anonymous comment*).

However, teachers admit that the schools’ local context provide opportunities for teaching and learning. Interesting rock and land formations can be found in the area to teach, for instance, causes of soil erosion, water conservation practices, etc. The Tsitsa River and waterfalls offers a great opportunity for fieldwork studies. Local environmental problems can also be a source of learning opportunities. The Tsitsa River catchment is a water scarce area. People depend mainly on natural water sources such as springs as the municipal supply, if available, is unreliable. The springs are often polluted as these are shared with unattended livestock. Although local leaders are making some efforts to address this problem, water management and conservation, the springs continue being unprotected posing a health risk to the local population. The participants are aware that government and local leadership play a role in the management of these natural resources, but crucially important is the need to involve learners and nurture them to be more responsible now as well as when they become adults.

"I think the learners can be the best ambassadors if they can be taught about the environmental issues in schools. They can teach others in schools and extend this to their homes and when they become adults, they will also teach their children. So, if the teachers can be capacitated to teach the learners, we can have better communities for future generations" (*Y. Mlungwana, Subject Advisor, DBE Qumbo District*).

6.6.2 Final Assessment

The Fundisa for Change teacher training programme has an opportunity for teachers and education practitioners to gain South African Council for Educators (SACE) professional development points. Further to this, the training programme or course, when facilitated in partnership with a partner High Education Institution, in this case Rhodes University, can be accredited at NQF Level 6. For this purpose, course participants are required to complete several assessment tasks and compile a final Portfolio of Evidence for assessment. This section outlines the final assessment outcomes for the 'teaching water and catchment' in the Social Science Geography senior phase course undertaken by ten teachers and two subject advisors.

To start with, on the first day of the course participants completed a knowledge test with the intention of establishing their environmental and subject specific prior knowledge. The same test was completed at the end of the course in order to assess how their environmental and water specific content knowledge improved. Furthermore, participants were required to complete two more tasks, namely:

- *PoE Section 2: On-course Assessment Tasks*

These were a series of tasks where participants demonstrate their subject knowledge, and knowledge of teaching strategies and capacity to conduct quality assessments of their learners' work.

- *PoE Section 3: Work-away Assessment Task*

Here teachers were requested to develop a follow up workshop plan or lesson plan for deepening/extending what we have done during the course, for implementation and reflection.

Overall, nine teachers and one subject advisor completed all their assessment tasks successfully. The two unsuccessful candidates encountered personal and professional difficulties at the time of implementing the 'work-away assessment task'. Teachers and subject advisors required to implement either a lesson plan for Geography in Term 3 or a teacher development learning programme. Table 6-2 below presents a summary of the final course achievements pointing to the fact that participants managed to complete the course with marks ranging from 62 per cent to 90 per cent. Their PoEs also went through a moderation process undertaken by Rhodes University in order to make sure that the standard of achievement complied with the required benchmark.

Table 6-2: Final results from the Fundisa for Change assessment tasks

Participant	Final Knowledge Test (out of 40)	On-course (out of 60)	Work away (out of 50)	Total (150)	Final
1	31,5	56	32,5	120	80%
2	32,5	56	n/a	88,5	n/a
3	28,5	48	31	107,5	71,66%
4	25,5	56	32,5	114	76%
5	23,5	53	32,5	109	72,66%
6	19	43	32,5	94,5	63%
7	25	49	30	104	69,33%
8	24	48	38	110	73,30%
9	26	n/a	n/a	n/a	n/a
10	26,5	50	17	93,5	62,33%
11	36	59	41	136	90,66%
12	21	56	30	107	71,33%

6.6.3 Content Knowledge Test

The level of prior knowledge that participants presented at the beginning of the course was analysed against the level of knowledge gained by the end of the course. Participants completed the same knowledge test in these two stages of the course, however; only the second test counted towards their final assessment. The knowledge test included subject specific and 'water and catchment' concepts such as:

- what is a catchment;
- what are water resources;
- effects of soil erosion on water resources;
- human activities that causes soil erosion;
- what is a natural resource and ecosystem services (e.g. what are wetlands, functions and threats);
- analysis of a settlement from a type of settlement, justification why the settlement was located where it was and impact/risks to the settlement Land uses and impact on natural resources;
- sustainable practices; and
- climate adaptation and mitigation practices

In summary, participants responded to the pre-knowledge test successfully with an average of 31.4 per cent of questions answered correctly (12.5 marks out of 40 marks). The final knowledge test was completed with an average of 63.5 per cent of questions answered correctly (25.4 marks out of 40 marks). In overall an improvement of 32.15 per cent from pre-knowledge to post course content knowledge assessment.

In general, the questions that participants struggled with at the start of the course related to aspects such as understanding ecosystems services and functions; impact of land use on natural resources, sustainability practices such as rehabilitation; and climate change mitigation and adaptation. However, participants were more familiar with identifying the causes of soil erosion, as well as an average idea about defining what a catchment was, identifying natural resources, the concept of wetlands and aspects related to settlement questions.

There is evidence that the participants' knowledge expanded as a result of the training course particularly with regards to identifying threats and impacts of human activities on natural resources more broadly; understanding what ecosystem services and functions are; rehabilitation measures and climate change resilience responses. Also, a deeper conception of what catchments entail was improved.

From the above, it seems that course participants managed to make the connections between the different elements found in a catchment, making a greater analytical and critical reflection on how human activities impact on natural resources and vice versa, how the natural environment can have an impact on human wellbeing.

6.6.4 Lesson Plans, Learners Work and Teacher Reflections

The *on-course assessment tasks* (PoE Section 2) were divided in two parts. Part 1, worth 30 marks, focused on encouraging teachers and education practitioners to think about their teaching and practice and develop activities or lessons for learners, with an environmental water and catchments focus, that would foster reading and writing, listening with intent, active learning and developing critical and creative thinking skills. These are skills highlighted in CAPS. Part 2, also worth 30 marks; emphasised the need to work on developing appropriate assessment strategies and tools linked to the activities chosen by the teachers in part 1. Generally, participants addressed the PoE section successfully with a top mark of 59 over 60 marks, and the lowest of 43 marks over 60 marks. The average was 52 over 60 marks. The participants' evidence of work included in the PoE was assessed on the basis that a range of comprehensive activities with instruction was included, as well as accurate content and clear guiding questions for the learners. The main topics covered in the activities illustrated in this PoE section can be found below:

1. Settlement in a catchment and features that contributed to the location of this settlement (e.g. water supply, flood avoidance, building material food supply, etc.)

2. Wetlands: definition of key terms, what are wetlands, features and functions.

3. Map work (task): curriculum links such as coordinates, define latitude and longitude; use of topographic maps and make calculations (such as distance between points), justify the location of the specific site (e.g. Tsitsa Falls, Vryheid Nature Reserve).

4. Investigation of a settlement (project): description of key concepts (settlement, rural settlement, urban settlement, renewable and non-renewable resources); investigation of a settlement (e.g. identify natural resources in the settlement); human activities that relate to water conservation in the area; discussion on the impact of water resources have on the settlement's growth or decline of the population, and how former policies of Apartheid led to the formation of the settlement. Discussion activities on social and environmental issues were also included.

5. Know your catchment, definition of a catchment as land and water are linked in a natural system with natural resources that contribute to human survival.

6. Water use by sector (e.g. agriculture, mining, etc.) and the interpretation of a graph and critical thinking and reasoning questions about the information presented in the graph.

7. Deforestation: definition and consequences such as effect on global warming.

The participants also provided good evidence that they were capable of developing relevant assessment tools with high order, middle order and lower order questions.

Further to the above, the PoE also required participants to engage with pedagogical concepts such as 'active learning' and 'critical thinking skills' and explain in their own words what they understood by such concepts.

> "Active learning is a teaching method where learners are given an opportunity to conduct an investigation based on their surrounding environment and have to recommend solutions between the environment and humans, that is how the two interact. This is a method that is both teacher and learner centred. The teacher and learners are constantly interacting thus ensuring effective teaching and learning. The methods accommodate learners' individuality in terms of how they respond to ecological concepts, issues and risks relating to local and global contexts" *(S. Dlamini, Ngzaza J.S.S).*

> "Critical thinking skills are the skills that give an opportunity to learners to find solutions to problems they might be experiencing. These skills enable learners to look at the contexts from various points of view, … Learners are able to analyse, be critical and make judgements based on their finding on various issues in the field of study. Critical thinking skills enable learners to use their own imagination" *(S. Dlamini, Ngzaza J.S.S).*

In addition to the 'on-course' tasks; the participants were requested to employ some of the learnings gained from the Fundisa for Change course in the form of developing a lesson plan for the school term that followed after the course took place in May – Term 3. These *work-away assessment tasks* (PoE section 3) had a more practical approach and required teachers to develop, implement and reflect on a lesson in their classroom, and education practitioners to develop, implement and reflect on a teacher training workshop in their work-place. It was expected that a detailed lesson plan was provided also with evidence of the learners' work, lesson plan reflections on what worked or did not work, improvements, etc. The teachers worked on this task in two groups, one group from Qumbo district and another group from Mt Fletcher. The CAPS requirements for Term 3 defined the scope of the subject concepts, content and assessment strategies. Two main curriculum topics were covered in the lessons developed. These can be found as follows:

1. Settlement and land use (3 hours): urban and rural settlement and land use zones; critical analysis of urbanisation, Investigation of a settlement (project), social and environmental issues related to settlements, suggestions sustainable land use practices and interviews with community members.

2. Surface forces that shape the earth (3 hours): impact of people on soil erosion. Human contributions to erosion through agriculture, construction and mining. Suggestion on how to prevent soil erosion. Fieldwork also included.

Although the learners' evidence of work was provided by all participants, evidence for each one of the activities included in the lesson plans was lacking. The lesson plans were presented in the format that is required by the DBE (template). Some teachers extracted activities from textbooks and expanded them with further ideas from the Fundisa for Change units and workshop. An assessment tool for each

lesson plan was also attached and completed. This tool seemed to be an evaluation template also provided by the DBE and includes questions such as “do the lesson plans show the links between the environmental issues in relation to the relevant content; challenges in implementing the lesson and suggestions for improvement; and what teaching methods can be included in the lesson plan to enhance environmental education”. The general feeling was that more time was needed to implement the lesson plan and that the lesson should have included fieldtrips to towns and cities so to be able to explore these types of settlements. Some expanded opportunities highlighted by the teacher participants also refer to the need to enhance the environmental and sustainability focus, particularly on water resources and ecosystem services where possible. It was also acknowledged that the fieldwork carried out by the learners should have been planned better and should have included more concise guiding investigation questions.

The overall reflections on teachers and education practitioners’ own lesson plans and workshop programmes are outlined below:

- The teaching methods used that were effective included some of the visual aids used, field excursions and data collection activities.
- Learners improved their knowledge and critical thinking skills with regards to sustainable agricultural practices, land management and their impacts on catchments.
- The lessons managed to contextualise CAPS content with the learners’ day-to-day activities and develop interest in sustainable practices.
- Learners were able to make connections with what was taught in class and real-life situations.
- However, some learners still found it difficult to interpret information from aerial photographs.
- Some learners also found it difficult to conduct interviews hence the need for more structured interviews and tools.
- Furthermore learners, in some instances, struggled to convey information and narrate their findings.
- Overall, the learners’ vocabulary was enhanced with new concepts, which related to the ‘water and catchment’ units herewith dealt with.

In summary, the course participants’ work-away assignments were fulfilled satisfactorily with an average of 28.81 marks over 50 marks. The lowest mark was 17 out of 50 marks; and the highest was 41 marks out of 50 marks.

6.6.5 Teachers Course Evaluation

At the end of the five-day training course, the participants were handed out a course evaluation form. Key questions included whether the course was pitched at the right level, assisted to support participants’ teaching practice, and more. The responses from the evaluation forms were examined and summarised as follows:

- Length of course: the majority of the participants felt that the length of the course was acceptable with a few exceptions who thought the course was either too short or too long.
- Content: the content covered in the course was very relevant.
- Amount of Information provided was suitable.

- All material provided were very useful with particular reference to the 'water and catchment' units, and the core text on teaching methods. It was suggested that FET materials should also be developed as there were two teachers who also taught this phase.

- The facilitators were considered knowledgeable on the subject and topics at hand and were able to support the week's programme with appropriate facilitation methods and approaches.

- The best aspects of the course vary from individual to group but generally the participants appreciated the group work and participatory approaches employed.

"Trainers are very actively involved and … ensured that there was constant interaction".

- Participants also enjoy the practical demonstrations (e.g. MiniSASS) and the fieldtrip. However, it was highlighted that the map skills session was greatly appreciated, maps should have been a bit more-clear so to make this session more effective. There is room for improvement such as the map work (maps needed to be clearer).

- Level of assessment tasks: Surprisingly the assessment tasks were considered by the teachers to not be challenging enough. However, they all agreed that the tasks had contributed to their professional learning.

- Application of new knowledge: it was acknowledged that what has been learnt would mainly be used to improve teachers' assessment practice, their own teaching in general as well as extra-curricular activities. They felt that what was learnt should be shared with other colleagues.

- Participants also highlighted the need for more teaching materials and better-quality textbooks so to continue improving their teaching environmental content and concepts.

- There was also recognition that support from fellow teachers, DBE and community involvements is needed.

- The quality of course over other courses attended was considered the BEST COURSE ever attended by all participants involved.

- Final reflection on course are captured below:

"It develops teacher as a person, as a teacher as well as community member. Equipped us about what is happening in the real world" (*S. Sinazo, Jenca S.S.S.*)

"Facilitators to keep on working with this project so that the country would be at the same level with other countries. So that can be marketable to this changing world and make people live longer, stress-less and have a comfortable life" (Z. Mashalaba, Mqokolweni J.S.S.)

"The course should reach out to all teachers" *(A. Nongcaula, Qumbo Technical High School)*

"Now I am confident to teach Geography" (*Anonymous evaluation feedback).*

6.7 DISCUSSION AND REFLECTIONS ON THE COURSE

This section synthesises the main outcomes of the Fundisa for Change 'Teaching Water and Catchments' course. Whilst *Section 5* provided a description of the main findings, the sections that follow, attempt to synthesise the main analytical findings in relation to the intended outcomes of the Fundisa for Change teacher training course and programme theory or assumptions. As previously alluded to, the Fundisa for Change programme promotes a CAPS++ approach through supporting and

extending the environmental and sustainability content, methods and assessment practices outlined as 'minimum' requirements in CAPS.

Furthermore, this section includes some reflections by drawing on realist evaluation approaches centred on the following themes:

i) understanding the *Mechanisms* through which an intervention achieves its Outcomes;

ii) understanding the *Contextual* conditions necessary for triggering these Mechanisms; and

iii) understanding Outcome patterns (Pawson and Tilley, 1997).

With this in mind, the text that follows explicitly outlines the analytical outcomes derived from the Fundisa for Change intervention synthesised as follows: improve teachers' content knowledge, pedagogical practice (teaching methods), and assessment practice.

6.7.1 Content knowledge: improve educator disciplinary and environmental knowledge

Geography core content or disciplinary learning required to teach CAPS includes earth as a system, key life supporting processes, and how ecosystems function to support the diversity of life; and more specifically the need for teachers to understand climate change and (changing) weather patterns, sustainable development principles and practices, urbanisation and land use management and sustainability, management of natural resources, including water. Water in the Social Science Geography senior phase emphasizes the understanding about water availability and demand in South Africa, river health and catchment management, wetlands and wetland conservation, and the responsible use of water resources. It is evident from the participants' knowledge test that 'water and catchments' content knowledge has improved, expanded and exceeded the curriculum minimum requirements to include aspects such as ecosystem services and functions. Most importantly, the teachers and education practitioners showed evidence of understanding these concepts within a systems approach or catchment as a complex social-ecological system. The interdependencies, causes and processes between and among different natural and social elements within a catchment were better understood. These included causes and effects of, for instance, land degradation and unsuitable water resource use. Furthermore, participants also had the opportunity to expand their knowledge and improve their mapping skills, engage in discussions and recognise bias and different points of view, develop their own ideas based on the new knowledge and suggest solutions to problems. Evidence of these improvements are apparent in the type of learning activities and lessons developed and recorded in their Portfolios of Evidence as well as the discussions generated during the five-day course sessions.

The learners' work enclosed and teachers' reflections on their lesson plan implementation make the assumption that learners have improved the required content knowledge (e.g. sustainable agricultural practices, land management and their impacts on catchments). Further research is needed regarding whether the implementation of lesson plans addressed the knowledge progression needed for the age and grade appropriateness across the academic terms. This would establish whether the lesson plans developed were taught at the level needed so avoiding 'under-teaching' learners. Also, further research would be able to capture the detail and nuance experienced in the classroom.

6.7.2 Teaching methods: Improve your teaching practice

In Social Science, both History and Geography, it is essential that learners are encouraged to engage in critical and creative thinking by asking questions such as: 'Who? Where?, What?, Why?, When?, How?, Should?, Could?, Is/Are'; and in the senior phase 'If?'. Language is therefore an important element of this subject area and for learning to emerge, different forms of resources (oral, written and visual) are encouraged. The use of maps, aerial views, globes, graphs, and drawings assist to help learners interpret and present the world. These visual skills contribute to a kind of literacy called 'graphicacy'. Over and above the listening, reading, writing, graphicacy, critical and creative skills;

Geography also has a strong focus on developing field observation and research skills by promoting active learning processes engaging learners with investigating their local environment and coming up with appropriate solutions. In particular, these skills are important for learners to enter the Science, technology, engineering, and mathematics (STEM) fields. These skills require teachers to design suitable teaching methods such as field investigations, demonstrations, modelling, etc. The lesson plans developed by the course participants included a range of methods, notably presentations, investigations and discussions. Some lesson plans were based on activities found in textbooks and expanded by the teachers with additional activities, which included fieldwork and critical discussions. It seems that the effective teaching methods used included the use of visual aids, field excursions and data collection activities; however, these were not without their challenges.

6.7.3 Assessment: Improve your assessment practice

The national education curriculum in general promotes the assessment of minimum standards of knowledge and skills set for each grade in all subjects. Specifically, the curriculum prescribes three different types of assessment; namely tests and examinations by using different types of questions and project-based assessment to enable qualitative assessments. In Social Science Geography, both skills and content are assessed. The assessment of skills usually involves writing (e.g. essays) and oral work such as debating. As mentioned above, the teachers' learners often experience difficulty in writing at length, narrating, etc. Therefore, the quality of learners' work depends on the care with which their tasks and questions are set. In this course, the teachers provided good evidence that they were capable of designing different types of assessment, developing relevant assessment tasks (including reading, writing and discussions) with high order, middle order and lower order questions for different cognitive levels required as well as relevant assessment tools linked Geography skills and knowledge.

6.7.4 Unintended outcomes of the course

The Fundisa for Change course seek to achieve the improvement of teaching practice of 10 Geography senior phase teacher in bringing the environmental focus found in the curriculum. Over and above these outcomes and as a result of two subject advisors attending the programme, the course content reached out to further teachers from the Qumbo district. Due to the work-away assessment designed for subject advisors, the district subject advisor for this area organised a one-day workshop with 18 schools (3 high schools and 15 senior primary schools) with a total of 34 teachers. The theme of the workshop was "Water is Life" and covered topics such as climate change, water pollution, water saving tips and water auditing. Sections of the Fundisa for Change 'water and catchments' units were copied together with other learning support materials and handed out to the teacher participants. The teachers were also encouraged to join other environmental education programmes to assist with further resources and motivate them to continue working with such water related topics. The workshop aimed to "assist teachers to educate children to develop a healthy environment and responsible attitude towards water resource management".

Further to the above, the subject advisor representing the Mount Fletcher district spoke highly to the provincial head of Social Science about the content, structure and quality of the course, including the benefits for the Geography teachers in improving their practice. As a result, the provincial official has indicated that the Fundisa for Change programme with focus on Geography should be implemented in as many districts as possible in the Eastern Cape. Plans to make these suggestions a reality is currently being discussed.

6.8 FINDINGS AND CONCLUSIONS

6.8.1 Final reflection and key lessons

In this section, key reflections are highlighted to share some insights with regards to the Fundisa for Change course piloted for the purpose of this study. The lessons learnt from this process refer to the 'activators' or mechanisms that have fostered or triggered the attainment of the intended outcomes set for this intervention. As referred to above, the context in which these outcomes have come about is taken into account so to understand in which conditions this intervention may be effective or not. In other words, what are the context-mechanisms-outcome (CMO) configurations (Pawson and Tilley, 1997) or lessons to take forward into further development of a Fundisa for Change 'Teaching Water and Catchments' course?

Concepts, content knowledge and critical skills in context:

Experiences, skills and critical thinking have been nurtured and merged with the teacher's and learner's abilities to read, write, listen and speak within the content of Social Science Geography. The programme was designed in a way that included a variety of activities ranging from listening to presentations to field excursion supported with low, medium and high order questions. The local context allowed for meaningful examples of some key environmental topics and concepts as well as the investigations of traditional practices, local knowledge and the exploration of more sustainable lifestyle choices.

"Fundisa for Change created meaning for the real-life activities of the teachers' daily living, suggesting that learning takes place through relationships between people and connecting prior knowledge with other types of knowledge. So that the teachers were working on authentic tasks that take place in their real-world setting" (*Y. Mlungwana, Subject Advisor, DBE Qumbo District)*

Pedagogical content knowledge supported by the programme design, pedagogical tools and additional resources available locally:

Improving teacher's capacity for 'knowing how to teach' the content and concepts of Geography with a variety of methods, including the 'water and catchments' environmental topics, was one of the highlights of this course. Different aspects were incorporated in the programme design and materials. These included a five-day programme which allowed for a variety of demonstrations and practical activities to take place, as well as relevant water modules and core texts, the presence of experienced facilitators and encouragement of education officials, and a comfortable venue available locally for participants to work together during the day and evening.

Assessment practice, the role of the Portfolio of Evidence and professional support:

Prior to attending the course, teachers seemed to have a good understanding of the different assessment tasks required for Geography senior phase. Teachers often attend workshops organised by the education department to improve their professional capacity. In addition to these professional development initiatives held in their districts, the PoEs were designed to support teachers in developing relevant assessment tasks so as to be able to implement these with their learners.

Quality of lesson plans encouraged by group work and individual competency:

The careful selection of teachers followed a process handled by the district education department. Teachers were selected based on their knowledge of the subject at hand and in some instance their interest and participation in other environmental education programmes. In addition to teachers being able to teach the Geography subject, the course complemented their

knowledge and skills with relevant content, suitable amount of information provided, useful materials and knowledgeable facilitators. The quality of the lessons submitted was satisfactory and structured according to the lesson plan templates provided by the department of education which teachers were already familiar with. Furthermore, it seemed evident that teachers were used to working in groups established according to their districts. The combination of the above made it possible to present reasonable lesson plans in terms of structure, activities linked to curriculum requirements, etc.

Strengthen the environmental focus and assessment tasks:

Although the environmental focus of the course was made obvious in the activities and lesson plans developed by the teachers, it is a concern that some teachers did not pay enough attention to strengthen this focus over and above what is found in the textbooks and continued with 'business as usual'. The use of textbooks without adaptation and improvement of the content by the teacher may be a concern. This aspect needs to be challenged so that learners are taught at the right level with relevant content and critical skills.

The use of Teaching and Learning Support Material not clearly reflected in lesson plans:

The reliance on textbooks may also constrain teachers from the use of other teaching support materials. This seems to be a common concern, as teachers tend to continue using the resources that they are familiar, without applying their creativity and making use of other sources of information. The depth and quality of the textbooks may vary from publisher to publisher. However, teachers should be able to engage with this text critically and improve the weak areas with additional information and resources.

SACE and accreditation as motivator to improve teaching practice:

Teachers are required to strive for continuous professional development. The fact that this course is both SACE endorsed and NQF accredited motivates teachers and educators to participate in such programme.

6.9 CONCLUSION AND RECOMMENDATIONS

In conclusion, the Fundisa for Change "Teaching Water and Catchments" course, has the potential to contribute to the curriculum overarching intentions with regards to the following:

- Promoting knowledge in local contexts while also being sensitive to global imperatives.
- Infusing the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa.
- Understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.
- Using science and technology effectively and critically showing responsibility towards the environment and the health of others.

Furthermore, the Fundisa for Change course intended outcomes have been achieved inasmuch as:

- Fostering transformative environmental learning through teacher education.
- Developing foundational knowledge and subject specific knowledge on Water and Catchments.

- Developing subject specific pedagogical content knowledge linked to teaching Water and Catchments.
- Fostering subject specific assessment practices of quality on Water and Catchments.
- Developing reflexive scholars and citizens that can practice in social transformation.
- Supporting an open, critical approach to knowledge.

In conclusion, the Fundisa for Change course supported the enhancement of teachers' environmental learning competency in teaching the 'new' environmental and sustainability knowledge found in the curriculum. The support from the Department of Education officials was a critical factor in these achievements. The Fundisa for Change programme also proved to be a suitable framework for the development and/or adaptation of curricular and learning material with focus on 'water and catchments' content knowledge and appropriate learning pedagogies.

Broadly, the programme, in the case study area, has contributed to the national green economy skills priorities highlighted above, as well as other global and national teacher education and development policy priorities.

However, based on the above discussions and reflections the Fundisa for Change "Teaching Water and Catchment" course and programme should consider the recommendations that follow.

- *Learning programme approach to address progression and environmental focus through out*

It seems that there is the need to find ways of getting teachers to engage more with the texts and do more creative work above what they already know. Meeting CAPS++ needs to be ensured. Highlighting the environmental elements are essentially what makes this course different and significant. However, even though the environmental aspect of the topics is integral to the curriculum, there are some teachers that are avoiding these higher order, more complex aspects of their teaching by reverting to 'standard textbook activities' and working with 'business as usual'. Also significant in this course is the development of higher order thinking which needs a steady build up from key concepts to understanding relationships, tensions and complexities. There is also the need to ensure that a holistic and systems thinking approach is integral to the 'water and catchments' module and that it is understood, grasped and embraced in the teachers' assessment task. A suggestion for addressing this problem might be to create a more holistic task where teachers develop a LEARNING PLAN instead of a series of smaller tasks. This learning plan would emphasise:

a) Progression of knowledge within a particular grade.

b) Increasing complexity of a particular topic throughout the year. In the Social Science curriculum this can be facilitated through focussing on Mapwork (Term 1), Development/Settlement (Term 2/3), Conservation/Sustainability and Resource use (Term 4).

Furthermore, other recommendations include the following:

- PoE assessment tasks should be also linked to the use of TLSM more strongly.
- Materials should also be developed for the FET phase.
- On-going revision of 'water and catchment' units so to keep up to date with the changing nature of the content and subject appropriateness.
- Consider a revision of the material within the 'decolonisation of the curriculum' discourse in South Africa.

- Scaling up through the Department of Education skills development programmes and with the support of other funders.
- Training of further relevant subject advisors together with the teachers they support.

7 SUMMARY AND CONCLUSIONS

7.1 SUMMARY

This project set out to compile a single-reference document guideline for rural community-based natural resources management and rehabilitation through a catchment management approach. Through this process, the project aimed to:

1. To improve water-energy-food security as well as environmental health in rural catchments.
2. To empower and upskill rural communities to support their own green villages (incl. service delivery).
3. To identify stumbling blocks to guideline implementation and catchment management intervention sustainability in rural areas.
4. To improve the state of rural catchments from the individual – household-village outwards
5. To develop an education and skills development programme to rural job creation to support green villages.

Over the course of the project duration, the project team has held an expert dialogue to discuss the vision of the project, the reality of the project location area, existing projects and recommendations by the experts. This contributed to the review of the existing strategies, policies and projects to identify lessons learnt for undertaking the development of the Guidelines. The aim of the Guidelines is to improve the water-energy-food security by looking after the Natural Capital of the catchment area, to ensure the sustainability of ecosystem goods and services which provide livelihoods to the rural communities.

A key component of the project was the education focus, that understanding of and sustainable utilisation of natural resources must become general knowledge. Therefore, significant effort was invested by the project in reviewing and updating the Geography curriculum in partnership with Fundisa for Change, and capacitating the teachers to be confident in teaching the course material, through a case study held in the Eastern Cape.

The implementation of the project achieved the following outcomes in relation to the objectives of this project:

1. ***To improve water-energy-food security as well as environmental health in rural catchments.***

A primary objective of this project was to compile a single document that would provide guidance at a household level to support integrated natural resources management within a catchment approach. By bringing all the aspects together and breaking the silo approach, explaining how activities and processes are interlinked and integrated, as well as providing the guidance for sustainable management, utilization, protection and rehabilitation of natural capital to build sustainable and resilient livelihoods at the village level. The Community-Based Catchment Management Guidelines (volume 2 of this report) provide a single reference point for government departments, private sector, donor agencies, extension workers, community-based initiatives or households to learn and understand the water-energy-food security nexus within their catchment, and provides guidance how to start addressing the challenges.

2. ***To empower and upskill rural communities to support their own green villages (incl. service delivery).***

The objective sought to empower households and communities, by using the Guideline document, to become more self-sufficient in managing their own environments and mitigating the challenges facing their livelihoods, and thereby become less dependent on Government to redress historical impacts. The guidelines include livelihoods requires and small-scale service delivery to livelihood upliftment at the household level.

3. ***To identify stumbling blocks to guideline implementation and catchment management intervention sustainability in rural areas.***

Together with the expert dialogue, and through the review of existing policy, projects and guidelines the project identified the stumbling blocks to sustainability of natural resources related management activities in rural areas, as being community ownership. This supports the need for more community-driven awareness and involvement in landscape management and rehabilitation.

4. ***To improve the state of rural catchments from the individual – > household – > village outwards.***

Through empowering households, through implementation of the guidelines, would develop an understanding of the system and interconnectedness of the household within the village, and within the catchment, i.e. that an activity at a household level does have an impact whether positive or negative on the whole system; thereby creating a shift in perception that the catchment impacts on the individual, but rather that the individual impacts on the catchment. When the sense of community exceeds the sense of self, then an individual's sense of responsibility develops; then communities will be able to move away from the "tragedy of the commons". Through the updating of the school curriculum and the development of the guideline document, provide the materials to support raising awareness of this need to shift how households and communities think about their natural environments.

5. ***To develop an education and skills development programme to support rural job creation to support green villages.***

The original objective was to target adult further education, with the idea of upskilling learners in Natural Resources Management (NRM) activities, which in turn could be used to establish green jobs and businesses. However, during the expert dialogue at the start of the project several challenges to this objective were identified, including, inter alia:

- Attracting adult learners into this field, as opposed to more "lucrative" skills training e.g. finances, engineering, medicine, requires the learners to understand and comprehend the impact of human activities on the environment, and the resultant water-energy-food-environment-livelihood security nexus. This nexus is not well addressed in secondary school curriculum, so the awareness to attract learners is lacking, and therefore it wouldn't be feasible to start at the end of the education process.
- The noticeable age gap in residents of the target community structures, where the number of young adults were very low due to the rural-urban migration limited the availability of participants.
- The scope of developing a SETA and Department of Higher Education accredited training course from scratch, within the project timeframe and budget, was over ambitious.

As a result of these challenges, the focus of the education programme for knowledge transfer was shifted to Secondary school education, thereby creating awareness of the water-energy-food-environment-livelihood security nexus and attracting school-leaving learners in these fields. This also provides time for the informed structuring and development of an appropriate SETA and Department of Higher Education accredited training course to support the upskilling of NRM activities into green jobs.

In addition, the project actively participated in knowledge transfer activities including regular participation in the Ntabelanga Laleni Ecological Infrastructure Project (NLEIP) (now Tsitsa project), resulting in a shift at Government level from employment driven approaches to livelihood driven approaches.

7.2 KNOWLEDGE TRANSFER

Three forms of Knowledge Transfer were conducted in the course of this project:

A. Environmental education and training case study, with Fundisa for Change (discussed in Chapter 6).

B. Participation in the NLIEP, now called Tsitsa Project, meetings and sessions
C. Presentation at the SER International Conference in Foz do Iguaçu, Brazil 2017

There have been other smaller and informal interactions including meetings and sharing of the draft outcomes with other projects and Government Departments.

7.2.1 Ntabelanga Laleni Ecological Infrastructure Project (NLEIP)

In addition to the Fundisa for Change "Teaching Water and Catchments" course, the WRC Green Village: Catchment Management Guidelines and Training Project also participated in the Ntabelanga Laleni Ecological Infrastructure Project (NLEIP), now called Tsitsa Project.

The NLEIP is a collaborative approach between various stakeholders such as government, communities, researchers, practitioners, consultants, NGOs and other to engage with projects in the Ntabelanga-Laleni area across a broad range of issues, for example addressing and rehabilitating the lad degradation and soil erosion as well as developing livelihoods. The NLEIP holds regular meetings where the various stakeholders are invited to share information and developments with the participants in NLEIP. More information about the NLEIP is found in *Appendix 13 – Current Point of Departure for the Tsitsa Project (NLEIP)*

Mrs. Louise Lodenkemper has been the project team representative at NLEIP. She has regularly travelled to, attended and contributed in the NLEIP meetings and workshops, including:

- Provided input to the Ntabelanga Laleni Ecological Infrastructure Project (NLEIP) Stakeholder Analysis.
- 14th-15th July 2016: Attended the NLEIP Science Management Forum in Grahamstown.
- 8th-11th November 2016: Attended and presented the Draft Guidelines at the second NLEIP Science Management Forum in Grahamstown. Presented to representatives of DWS, DEA and DAFF as well as various relevant stakeholders.
- 30th-31th May 2017: Attended the Think Tank and training on Climate Change Adaptation and Disaster Risk Reduction in Grahamstown.
- 12th-13th July 2017: Attended an NLEIP meeting in Grahamstown.

Key outcomes from the NLEIP:

- Through the NLEIP initiative the community of practices are working more closely than before.
- There is also an increase in practical activities in the catchment, including the shift that "livelihoods" was finally being spoken about at the start of conversations.
- In a workshop with officials from DEA:NRM and they were also emphasising the need to look at livelihoods, not jobs for future projects.

The project has also been presented at various working groups and other meetings to raise awareness of the project, solicit input and support for the project. These include:

- 19th-20th May 2016: Tour by Terry Everson around Okhombe Village in the Drakensberg to meet the Okhombe Monitoring Group which has been monitoring a LandCare site for the past 10 years.
- Meeting with Piet Louis of Working for Wetlands programme (DEA-NRM).
- Meeting with Francis Steyn of LandCare Western Cape Department of Agriculture.

7.2.2 Society for Ecological Restoration (SER) 2017

The Society for Ecological Restoration (SER) 2017 International Conference was held in Foz dos Iguassu, Brazil from 27 August to 1 September 2017. Dr Samantha Braid, Project Manager and Mrs. Dulce Lazana, project researcher, attended the conference on behalf of the project. At the WRC hosted workshop, Dr Braid made a presentation about rehabilitation work in Africa, "**Natural Resources Management and rehabilitation in 3 African Countries. A Narrative"** with a specific section about

the WRC Green Village: Catchment Management Guidelines and Training – the need for the project, project work and draft guidelines.

7.3 RECOMMENDATIONS

Key recommendations from the various aspects of this project include:

1. **Addressing issues of Land Tenure:** The complexity of land tenure in former homelands needs to be unpicked and addressed to ensure that appropriate responsibility and accountability can take place for sustainable land management, and prevent ongoing degradation of resources slipping through the administrative gaps.

2. **Revised EIA process for rural village-driven projects:** as identified the formal legislative process to obtain the various necessary authorisations and permits for rural villages to conduct rehabilitation or preventative activities on their land is both administratively burdensome and expensive. A more streamlined and supportive approach should be developed for these areas and types of activities, for example taking the General Authorisations approach of the National Water Act.

3. **Using a catchment approach to landuse planning, providing an integrated management approach for natural resources management:** Using a catchment approach to planning provides for the integrated and coordinated approach to resources management and moves away from the silo-approach of each Department conducting their own activities in isolation, duplication or contradiction of other Departments and role-players operating within the catchment area, as well as conducting landuse planning in isolation of the environment, its natural capital and ecological infrastructure and function This allows all activities to work towards the same goals, and each department implementing its relevant activities in support of the central goal.

   This is also applicable to the *Working for* Programmes that focus on individual aspects but not working within a systems approach. By using a village-based catchment management plan can guide the *Working for* programmes more realistically in terms of landscape rehabilitation to achieve more sustainable ecological and employment objectives.

4. **More education workshops with teachers:** The case study that was run in partnership with Fundisa for Change has received much interest and requests for more of such programmes to be run across the Eastern Cape, and potentially in other rural areas of the country too. By capacitating the teachers and developing their pedagogical knowledge and skills, they are more confident to teach the curriculum content thereby improving the student's knowledge. By rolling out the case study to other areas will also provide more substantive analysis to assess improvement of the quality of teaching on the national scale.

5. **Translation of the Guidelines into isiXhosa and Nguni to reach a wider audience:** the guidelines have been developed in English. The WRC should consider translating these into both isiXhosa and Nguni in order to reach a wider audience for implementation. The isiXhosa and isiZulu languages are similar in structure, as are the Nguni and Sotho languages, therefore translating into one of each will cater to a much wider audience. Furthermore, the guidelines are suitable for extension work in the villages, this could be further supported by illustrated summaries in support of educational materials and illiterate households.

7.4 CONCLUSION

The project has achieved its objectives, both within budget and timeframe. The development of the Guidelines and the Education Programme have received extensive interest and provide a foundation for future work in these fields.

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CHAPTER 4

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APPENDIX A: LAND TENURE

1. INTRODUCTION

The purpose of the report was to address the following;

- To provide a broad overview of land tenure in Umzimvubu Catchment area;
- To identify key challenges related to land tenure in terms of cultural structures for implementing catchment management activities;
- To make recommendations towards overcoming identified hurdles, in particular for community driven/ community-orientated catchment management activities. While the original idea was to look at land tenure in relation to community-oriented catchment management, the author realized that the layer of land tenure issues pertaining to the construction should be considered and included in the report.

1.2 BACKGROUND TO UMZIMVUBU CATCHMENT

The Umzimvubu catchment area has its footprint on parts of Joe Gqabi District Municipality, OR Tambo District Municipality and Alfred Nzo District Municipality of the Eastern Cape Province. "The Umzimvubu River is the largest undeveloped water resource in South Africa and the benefits to be derived from the use of this river are potentially of national importance. Harnessing the water resources of the Umzimvubu River, the only major river in the country which is still largely unutilised, is considered by Government as offering one of the best opportunities in the Province to achieve such development." (DWAF, 2014) The construction of the Umzimvubu Water Project is to be managed by the national Department of Water and Sanitation (DWS) in partnership with the Eastern Cape Provincial Government, the national Department of Energy and Eskom, the national Departments of Agriculture, Forestry and Fisheries (DAFF), and the Department of Rural Development and Land Reform (DRDLR). The DWS commissioned the Umzimvubu Water Project with the aim of developing a water resource scheme comprising two multi-purpose dams, Ntabelanga and Laleni dams, in order to provide benefits to the surrounding communities and to provide a stimulus for the regional economy, in terms of domestic water supply, irrigation, and hydropower generation amongst others.

1.3 LIMITATION OF THE REPORT

This is only a desk top overview, which can only present general impressions based on the author's understanding of land tenure and land administration in the study area. The generalisations are also based on a body of academic literature that has been used. No specifics will be included at this stage. The various laws and policies mentioned in the report, such as Betterment were implemented at different points in time, and unevenly. As a result of that, generalisations are not necessarily a reflection of some specific areas. In reality many of the 'communal' tenure contexts vary in many respects.

The report has been drawn up within the context of shifting policy sands. The Spatial Planning and Land Use Management Act (SPLUMA) 16 of 2013 (SPLUMA) is a national law that was passed by Parliament in 2013, but only became law post July 2015. The law is important because the repeal of many apartheid era laws has left our planning laws fragmented, complicated and inconsistent. For this reason, section 3 of SPLUMA says that the law tries to develop a 'uniform, effective and comprehensive system' of planning that 'promotes social and economic inclusion'[3]. Of even higher importance in SPLUMA is that it is applicable on a wall to wall basis, but is yet to be implemented in the rest of Umzimvubu catchment. Behind the scenes, the Department of Rural Development and

[3] http://www.customcontested.co.za/laws-and-policies/the-spatial-planning-and-land-use-management-act-spluma/

Land Reform is also developing a communal tenure policy. There is not yet sight of an end to the battle around powers of traditional leadership.

2. TYPES OF TENURE

There are two types of tenure applicable to this project, those of Freehold Tenure and Communal/ Trust Tenure, Figure A-1. These are described further.

2.1 FREEHOLD TENURE

A freehold estate in land (as opposed to leasehold) is where the owner of the land has no time limit to his period of ownership (Kenyon *et al.*, 2015). Therefore, the owner of the land can reap the rewards of their investment into the land (time, labour, money) and the land can be used as an asset or collateral/assurance. A portion of the catchment is made up of approximately 1 744 surveyed private commercial farms (See Figure A-1) held in freehold title (apart from the urban areas). The freehold tenure is predominantly around parts of Matatiele (with some patches of communal), Cedarville, Argyle and Kokstad. The commercial farming sector is organized and relatively easy to engage. This land is not immune from agricultural practices which will be subject of the future Catchment Management regulation.

One key feature of the rights on this category of tenure is that the rights are registered in the Surveyor General's Office as well as in the Deeds registry Office. Registered rights have a strict legal definition in terms of section 1(xviii) of the Land Survey Act No.8 of 1997:

> ''registration'' means the registration of any real right in or to land in terms of the Deeds Registries Act, 1937 (Act No. 47 of 1937), and ''registered'' shall have a corresponding meaning.

The implementation of catchment management strategies and activities could be done through organized farmer's associations, to which most, if not all commercial farmers belong. Planning could be conducted through the farmer's associations while implementation would have to be at the level of each farm operator or owner. The key distinguishing character of land tenure in the commercial farming areas is that each farm is operated by a single operating family or legal entity, with a few farm workers employed in some of the farms. In these areas it is easy to match land parcels to individuals on a one to one basis, making it easier to impose new land use restrictions. The person with the land right is directly responsible for sustainable land management of that land.

2.2 COMMUNAL / TRUST TENURE

The second category of land that constitutes larger portion of the catchment is part of the land that is commonly known as 'communal' or 'Trust land' in development discourses. One key common feature of this land is that it is under the jurisdiction of Traditional Leadership. Communal tenure is in varying parts of Matatiele, Mount Ayliff, Flagstaff, Mount Frere, Qumbu, Tsolo, Lusikisiki, Port St Johns and Ngqeleni magisterial districts. There are approximately 1 035 Administrative Areas (AA), which collectively make up 56 Traditional Councils.

What is usually referred to as 'communal' land is hardly communal. The concept of 'communal land tenure' is invariably used to denote African traditional or indigenous systems of land rights and access. This term is contentious because it implies collective ownership of land while in actual fact traditional tenure combines both elements of collective and elements of individual rights. The concept "communal" comes with a lot of historical baggage, drawing its history from being coined 'Crown land' during the colonial period (Weinberg, 2015). The individual and group rights may sit side by side, or may overlap or be nested. Accompanying this are misconceptions that under such systems individuals or households

have no established land rights, that land rights cannot be sold or otherwise transferred. These are in fact mixed tenure regimes comprising variable bundles of individual, family, subgroup and large group rights. In addition, traditional land tenure systems offered right of access in and control over land to women and other household members. Rights in arable and residential land were inheritable and the right only lapsed when all kin left the community (Delius, 2008). In fact, the predominant official thinking has been that Africans hold land on communal basis with chiefs as either owners or trustees. Chiefs had jurisdiction over people and land, but not ownership in the Eurocentric conception. When dealing with property rights, it is dangerous and grossly inappropriate to universalise application of terms such as 'ownership and trust' (Weinberg, 2015; citing Okoth-Ogendo, 1982; Cousins, 2008).

To this date, policy debate rages on within and outside the traditional governance system around expectations or rejection of the notion that land might in future be vested with the Traditional Councils. It was part of the apartheid government's architecture to establish a link between 'communal land tenure' and notions of tribal identity. That is a policy matter in the making. Feni (2016) writes;

> Traditional leaders attending a three-day Contralesa provincial policy conference in Mthatha have lashed out at the government for creating the wrong impression that rural communal land was owned by the people rather than by the traditional leaders[4]. "Communal land in rural areas is owned by traditional leaders. It is wrong to insinuate that communal land is owned by the people. The wars against land dispossession were even led by traditional leaders – kings and chiefs – and were supported by their people, the warriors,'' said Contralesa secretary general Chief Xolile Ndevu.

Weinberg describes land rights in communal tenure systems as 'socially embedded' and inclusive, individuals, families holding relative rights to the same land in different configurations (Weinberg, 2015 citing Cousins, 2008). An array of policy and legal machinery was successively used that prohibited black people from holding and managing land.

Before annexation the Transkeian territories were independent Chiefdoms. McLoughlin states that aside from the prior penetration of missionaries and traders in the Transkei, the administrative history of the Territories commences in 1858 (Mqeke, 1997:78-9). Originally the Transkei comprised the land between Bashee and Kei rivers annexed by Act 38 of 1877. The rest of the Transkeian territories were annexed as follows; Tembuland including Emigrant Tembuland, Gcaleka and Bomvana was annexed by Act No 3 of 1885. The Xesibe country, that is, the district of Mount Ayliff excluding the Rode valley was annexed by Act No 37 of 1886. The Rode Valley – "The country situated between the district of Mount Ayliff and Mount Frere" was annexed in terms of Act No. 45 of 1886 and Pondoland was annexed in terms of Act No. 5 of 1894.

[4] http://www.dispatchlive.co.za/news/no-such-thing-as-communal-land/

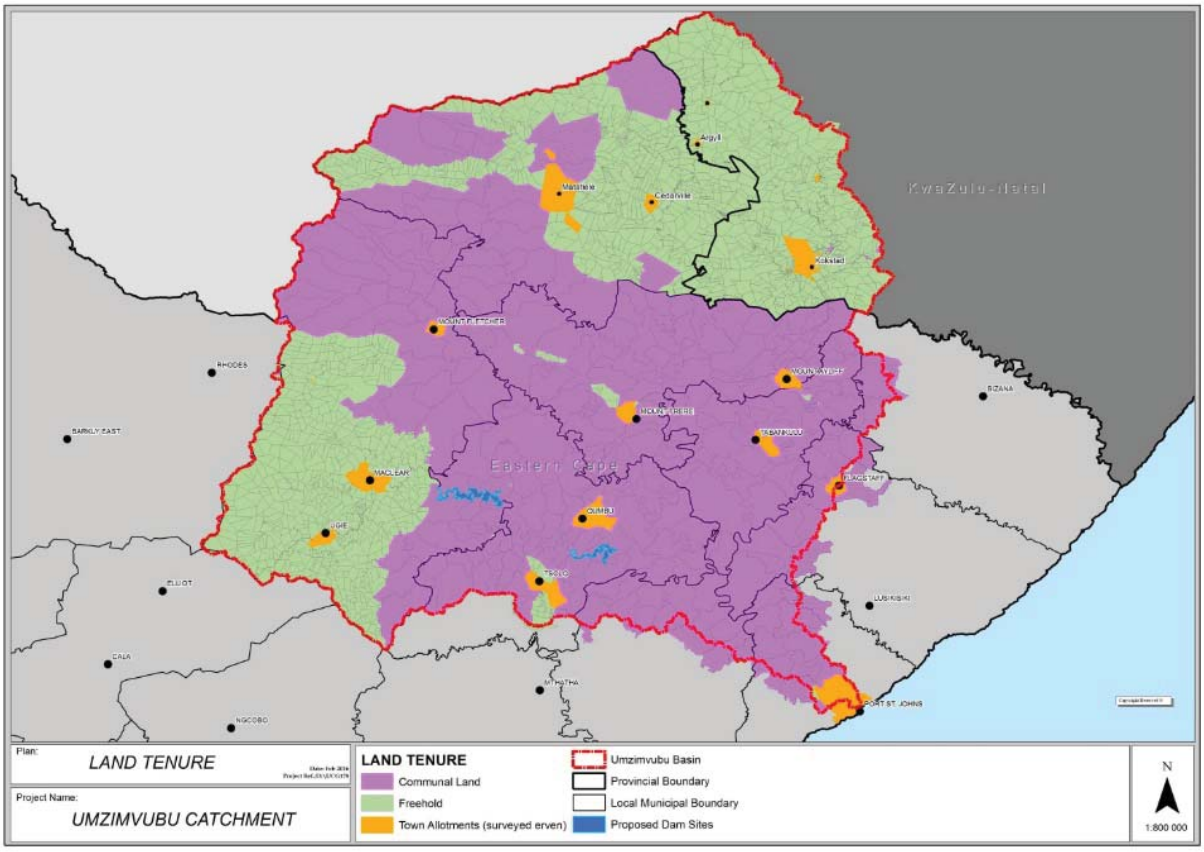

Figure A-1: Land tenure in Umzimvubu catchment

As a direct consequence of annexation, the land became Crown (State) land. The land in question is *de jure* State land on the basis of it originally being proclaimed Crown land during the colonial era. On that basis only, it is now either registered or unregistered state land held by the Minister of Rural Development and Land Reform on behalf of historical and current land rights holders. The State holds the land in a trusteeship or custodianship capacity, on behalf of *de facto* owners, who draw their rights from custom. It is on the basis of this history that local communities draw their customary relationship with the land.

> Hammond-Tooke (cited by Mqeke, 1997) states that once the magisterial rule was established in 1894 the districts were subdivided into locations (also referred to as administrative areas) of approximately thirty to one district. The government of the day appointed a headman who was subject to bureaucratic rules of censure and dismissal. All the chiefs and headmen were subjugated to magisterial control. The Bantu Administration Act of 1927 provided for recognition of the chief, followed by the Black Authorities Act No. 68 of 1951 which established tribal authorities in respect of assigned tribal areas.
>
> It should be noted that the British monarch did not become the owner of the land to the exclusion of the rights of previous occupiers who remained on the land and who were not immediately dispossessed by colonial conquest. The Constitutional Court confirmed this

point in 2003 in the case of Alexkor and the Government of the RSA versus the Richtersveld Community and others[5].

Coming closer to more recent history, Proclamation R188 of 1969, which was in all intent an attempt to clean up the complex land tenure picture which arose from different pieces of legislation. Proclamations 31 and 264 of 1939, and the Betterment Areas Proclamation (R. 196 of 1967) derived from the Native Trust and Land Act of 1936 (MXA, 1998). This proclamation gave credence to the quitrent and Permission to Occupy (PTO) system[6].

The post-1994 period becomes a critical milestone in giving a new colour and content to land rights in communal areas in South Africa[7]. The Land Rights Bill of 2000 could not see light of day because it was viewed to be costly to implement. The Communal Land Rights Act, Act 11 of 2004 (CLaRA) was framed by the government as legislation that would offer redress to people "whose tenure of land is legally insecure as a result of past racially discriminatory laws or practices", as proclaimed in Section 25 (6) of the Constitution. The Constitutional Court struck down the CLaRA in its entirety in 2010.

3. COMPLEXITY DIMENSIONS

3.1 Contestation of nature and content of rights dynamic

Any proposals for changes in land use is inevitably going to bring to the fore contestations. The contestations will take various dimensions. The various layers of boundaries that have been overlaid at various points in history, overlaid on top of pre-colonial social boundaries, combined with dynamics of population growth, have given rise to a range of tenure disputes. Cousins *et al.* (2011) notes that boundary disputes are not simply a product of colonialism. Some of the land tenure disputes translate to boundary disputes. To the extent that the boundary disputes translate into disputes over jurisdiction for traditional leaders, many of these boundary disputes constitute a major component of the work of the Commission on Traditional Leadership and Claims[8].

A second category of land tenure disputes is in relation to contestations around individual[9] and group[10] rights. When considered from the point of view of land rights holders this category of contestations highlights the disputes over use rights rather than sovereignty. This sub-section will devote itself to providing and uncovering some of the issues and approaches that could be considered in second category of contestations (individual vs group rights).

> "Europeans confronted a situation in which authority was not circumscribed by bounded space. As the Chief Magistrate complained to a chief in 1884: "It is impossible that a Chief can be responsible for the conduct of men in his ward, who don't acknowledge or obey him. It is quite impossible that either judicial or fiscal administration can be satisfactory so long as the several sections of tribes ... remain intermixed as at present." The chief had pointed out the fact that there was "no fixed boundary" and that people were "intermixed." He argued that there were people living eighteen miles from his kraal that were under his authority, but that the people living in the "space between us" belonged to two other chiefs.

[5] Case CCT 19/03, decided 14 October 2003

[6] More elaborate narrative in section 5 below.

[7] More elaboration on new order in 4.2.1.3 below.

[8] http://pmg-assets.s3-website-eu-west-1.amazonaws.com/policy/100729infosheet.pdf

[9] 'Individual' rights in this context is used to make reference to individual homestead rights, rather than an individual person.

[10] The notion of group rights is used to make reference to various levels of nested group rights. At times the contestations are between the various levels of groups or between neighbouring groups with overlapping or conflicting rights.

> In other words, space and rule did not overlap as predicated by the modern conception of sovereignty." (Crais, 2006)

The imposed government boundaries, together with the accompanying legislation overlaid a new dynamic to customary tenure, that of fixed boundaries, which must have been conceptualized differently in the African mind.

At the point of construction of the dam and its entire associated infrastructure one can expect that the breakdown in land administration system will raise a number of these kinds of complications. In all these different cases, research is going to be critical to bring some clarity regarding where the rights in question arise from, because that will give pointers to some of the plausible solutions could be. The first criteria one would need to clarify is whether the different categories of land in question were customary allocations made by either headmen or chief of the time or if these were PTO allocations? The current author imagines the traditional leaders will want fixed boundaries coterminous with other institutions, otherwise the presence of multiple 'boundaries' undermines their authority.

In the event of boundary contestations, the first question to ask is rather boundaries to what end? In the case of chieftaincy boundaries, the issue is obvious, about 'sovereignty'. When considered from the point of view of land right holder one will always have an interest to know where to graze cattle, where not to graze cattle, who is excluded etc. This changes the subject from being about boundaries to being about effective local rules. From the point of view of chieftaincy this makes sense, but when looked bottom up, where persons in specific spaces do not necessarily pay allegiance to the particular chief in command, soft boundaries make sense. Literature is very clear that pre-colonial chiefly boundaries were shifting and often overlapping or even got subsumed. The 1951 Act which tried to reinstate the power of chiefs created its own set of boundaries. These boundaries, problematic as they may have been, some of them grew to be accepted over time while others remained controversial. The starting point should be which ones are socially accepted and which ones are not? What are the underlying factors driving the disputes?[11]

It is important to understand these boundary issues in order to identify who is responsible for implementing catchment management and sustainable land management activities.

A number of arable allotments which had been allocated some time back in history will raise very complex contestations, particularly those that are earmarked for key infrastructure. Individual households may want to claim rights to these 'long abandoned arable allotments' on the basis of them either arising from customary allocation or a PTO right. Some larger community groups or some institution/s are likely to contest that these were individually 'owned' rights on a number of grounds, one which may be the fact that the households had not exercised those rights in 2 or more decades.

Some interest groups will use arguments which reinforce the idea of 'fixing' boundaries. Others will yet argue for flexibility of boundaries. But there is also evidence that the powerful do tend to manipulate ambiguity and negotiability in their favour, and that the less powerful may well be calling for more fixed boundaries, to protect their 'rights'.

The ambiguity can be used as an advantage by land-right holders, i.e. where it means there is investment by others into the land they will benefit and therefore the rights are clear, but where they have to invest (time, labour, and/or money) then the responsibility is ambiguous.

[11] These questions should be part of the outcome of a land rights inquiry that is proposed in this report.

3.2 Old order legislation approach

The first route one could consider in resolving this conundrum is to revert back to old order legislation. One common law instrument which is part of the muddled-up history which shaped land tenure in this context is Proclamation no 26 of 1936[12], which partially sheds some light how the colonial/apartheid regime handled customary or communal tenure. As far as the author is advised, this proclamation is still law and has the status of original legislation and still stands unless repealed, and applies to the bulk of 'communal' land that forms part of the catchment[13]. This proclamation does also provide for pre-existing (customary) land rights in Section 3 and 4(1). As original legislation and not subordinate legislation such as the regulations made in terms of Act 38/1927 and the 1936 Land Act, it is not affected by the provisions of Sections 5 and 11 of the Abolition of Racially Based Land Measures Act No.108 of 1991 which repealed the enabling sections of Act 38/1927, section 25, and Act 18/1936, in its entirety, with certain provisos to enable the amendments such as those by R23/1993.

In terms of section 9(1)(c) this law (under the heading, General conditions for cancellation) all allocations (including transfers, temporary arrangements and cancellations) made lawfully were to be kept in a register that was kept by the Magistrate. The phenomenon of forfeiture of rights in arable land "*ukuxhonywa kwentsimi*" was common practice in both Ciskei and Transkei. These rights were upheld subject to certain conditions that are clearly spelt out in the proclamation, and one of those is usage of the land by the right holder. In terms of this proclamation the PTO allotments under paragraph (iii) were liable for cancellation, with the allotment reverting to commonage if the rental is in arrears for period exceeding two years or if an allotment is not used by the registered holder without good cause for any period exceeding one (1) year. In terms of this proclamation, the cancellation of an allotment could only have been done legally if the allotment holder was warned at his/her last known residence, and afforded an opportunity to show cause why the allotment should not be cancelled.

Notwithstanding the point made above, there is somewhat uncertainty on how the democratic government would support use of old order tenure legislation. With or without the ambivalence to old order legislation, on the important factor is that this is still law that is entrenched in our statutes. At the heart of this proclamation is that there are key procedural requirements for forfeiture of individual land rights that is applicable to land had not been beneficially used for a specified period. In the same vein this piece of legislation cannot be followed to the letter of the print because of changed context. The magistrate is no longer in the land administration institutional structure. Most important, coming from this proclamation is the principle that individual rights were secure, subject to them being exercised.

3.3 New order legislation approach

The second equally plausible way of looking at this same contestation is to put on the prism of new order constitutional dispensation. The post-1994 gives new colour and content to land rights in communal areas in South Africa. Section 25 (6) of the Constitution states, "A person or community whose tenure and land are legally insecure as a result of past racially discriminatory laws or practices is entitled, to the extent provided by an Act of Parliament, either to tenure that is legally secure or to comparable redress.

In the backdrop of Section 25 (6) of the Constitution, the Interim Protection of Informal Land Rights Act, Act 31 of 1996 (IPILRA) was promulgated with a view to provide a holding mechanism for protecting informal land rights while government was supposedly developing a more elaborate tenure legislation. IPILRA provides protection to people who use, occupy or access land in terms of

- Customary laws and practices

[12] This is not by any means the only one of old order legislation that remains is our statutes, but it is selected here for demonstrative purposes only.

[13] M. Kenyon and M. Coleman are both acknowledged in this regard.

- Beneficial occupation, or
- Land vested in the South African Development Trust, or so-called self-governing Bantustan government, or any other kind of trust established by statute. (RSA, 1996)

IPILRA provides protection to people against deprivation of their informal rights to land, except under special circumstances. The Land Rights Bill of 2000 could not see light of day because it was viewed to be too costly to implement. The Communal Land Rights Act No.11 of 2004 (CLaRA) was framed by the government as legislation that would offer redress to people "whose tenure of land is legally insecure as a result of past racially discriminatory laws or practices", as proclaimed in Section 25 (6) of the Constitution. After a protracted legal challenge, the Constitutional Court struck down the CLaRA in its entirety in 2010. A new tenure legislation to replace IPILRA has not been enacted yet. IPILRA is currently in force and is used in conjunction with the "Interim procedures governing land development decisions which require the consent of the Minister of Rural Development and Land Reform as the nominal owner of the land, which was approved by Polcom on 20 November 1997 and amended on 14 January 1998 and also in terms of Section 3(1)(a)(ii) of Act 112 of 1991 as amended by Act 34 of 1996. What is important about IPILRA is that it provides a blanket protection, without clearly making a distinction between individual vs group rights. Courts are yet to pronounce on this individual vs group right.

A further new order legislative instrument is Promotion of Administrative Justice Act No.3 of 2 000 (PAJA) Section 3 (i) of which provides, that; Administrative action which materially and adversely affects the rights or legitimate expectations of any person must be procedurally fair. PAJA provides that any person whose rights have been materially and adversely affected by administrative action and who has not been given reasons for the action may, within 90 days after the date on which that person became aware of the action or might reasonably have been expected to have become aware of the action, request that the administrator concerned furnish written reasons for the action. If this line of thinking is anything to go by, it implies that PAJA provides a procedure for dealing with deprivation or forfeiture of individual land rights holders identified.

Yet another option available in the new policy mix is the approach that is in the evolving tenure policy documents which advocates, the "use it or lose it" approach (DRDLR, 2016). This approach does not propose any procedure to the loss, which may be in contrast to the conciliatory approach advanced by PAJA. The big challenge with common law is not just the array of laws which are ill understood and not implemented, but that it often does not present lasting solutions to some of the complexities of customary/communal/trust tenure.

In considering matters such as these courts would also look at the impact of the constitution on established custom of the communities concerned. The courts of law would seek to establish both the historic as well as the current position of group in respect arable fields which have not been planted over time. A court of law would need to establish, backed by facts if the arable allotments were wholly owned by the families concerned. If they did indeed have unfettered rights to these lands, would they have been ordinarily empowered to enter into either a lease or sale agreement on the land parcels in question? Among other evidence, a court of law would look for is precedence that can be used to demonstrate the strength of any of these arguments.

There is a need to understand why the allotments have not been used or the rights to these allotments exercised, e.g. have there been external influences such as collapse of the agricultural extension support programmes, or the post-1994 urban migration leading to change in demographics.

Customary law conciliatory approaches

A third equally plausible legal prism through which this conundrum could be considered is the customary law route, which is recognized in the country's legal system. Customary law, in this context, refers to

the local law of communities who own and/or use resources on a communal basis. It has also been described as the law of small-scale communities. It generally refers to the system of rules and principles that households and communities use to govern themselves and their access to shared resources. As we describe later, we refer in particular to 'living customary law'. (LRC, undated)

Customary law sits in a hierarchy of nested levels: Firstly, it provides for the internal rules of households and communities which regulate relationships between the members of the groups and provides for the rights of individual members of the community. This may entail households, agnatic groups or lineages, neighbourhood clusters, administrative area, chieftaincy and kingdom. Secondly, customary law provides for clarification of the different layers of nested rights against the outside world.

All of the tribes or communities who are subject of this report that are empowered to formulate and make use of their customary laws, for as long as they meet criteria set out. In Shilubana and Others v Nwamitwa, the Court identified four factors in ascertaining the content of customary law.

I. The history of the community (that is, historical evidence of how the rules were applied in the times of the elders and ancestors);
II. The community's current practice; and
III. The feasibility of the customary rule in current circumstances; and
IV. Compliance with the Bill of Rights.

Even if communities concerned did not have a law permitting forfeiture of land rights on arable land, it is well within their power, under customary law, to amend their custom and traditions to reflect changed circumstances. A customary leader is there to uphold the people's norms and values and if customs are to be changed, which they can be, it must be done by the whole community (from the Shilubana and Other Vs Mwamitwa).

Courts of law in South Africa are in recent history showing increasing accommodation for customary law, where legal arguments are put forward.

- Constitutional Court of South Africa: Shilubana and Others v Nwamitwa; CCT03/07(2008) ZACC9; Decided 4 July 2008.
- High Court of South Africa Eastern Cape Division: Premier of the Eastern Cape and Others vs Ntamo; Case No. 169/14; Decide 18 August 2015

The Constitutional Court in the Alexkor case about the Richtersveld community has found that customary land rights constitute ownership. The judgment does not, however, deal with the content of individual or family-based rights within customary systems. Most importantly about these cases is that customary law has a place in the South African jurisprudence. If the customary route is used by the courts of law, expert evidence would carry a lot of weight. Mqeke (1997) writes;

> It can be said that customary law is not incompatible with the doctrine of human rights: that the philosophical framework of customary law conception of human rights is to be located within the African variant of humanism popularly known as *ubuntu*. The concept of *ubuntu* received extensive judicial comment in the landmark case of S vs Makwanyane & Others dealing with the constitutionality of the death penalty.

The rights and obligations of customary law were historically given effect within a hierarchical framework which operated from a family (kinship) level (*inkundla yemilowo or ibhunga*), sub-headmen level, headmen level, chieftaincy level and kingdom level (Mqeke, 1997:28). Each of these levels had jurisdiction over different sets of matters. The over-romanticising of the system, leads Mqeke (1997) to an incorrect characterization of customary law as being open to the general public. While this may have been true at higher levels, it is difficult to imagine how *ibhunga* or *inkundla yemilowo* could include

outsiders to the agnatic group. The current author is also in disagreement with any perspective that casts an impression that the hierarchy was a hierarchy of court systems, which was and is not currently the case. This reductionist approach is a result of colonial and apartheid machinations to manipulate the system towards achieving control. One criticism which can be levelled at the romanticists approach to customary law is that (Mqeke, 1997) is founded on the mistaken tendency of equating the customary social forms of organization with the common law court system. A meeting of a group of homesteads related by clan name (*isiduko*) or to a (indibano *yemilowo*) or neighbourhood (*Ibadla*) cannot be simplistically reduced to or equated to a court system, because they are not equivalent, even though they may play that role. Customary law cannot be reduced to a hierarchy of court systems because it is more than that, but an embodiment of the culture and religion of a people.

The biggest problem with any form of romanticising of customary law is that it de-emphasises the psycho-social impact that the array of policy and legal machinery used by the colonial and apartheid governments has had on what is and what is not customary law. The current author thinks that factors such as urbanization, migrant labour system have tainted social conceptions of customary law. In a study conducted in Msinga in KwaZulu-Natal made the following findings;

> Our findings suggest that codified versions of customary law are indeed problematic. Processes of social change mean that 'customs' tend to be flexible and adaptable in response to change. But they also suggest that a focus on the 'customary' dimensions of local law is too narrow, and that as, Oomen proposes, a more inclusive notion of 'living law' is required. (Cousins, 2011)

While the increasing embrace of customary law by both the academic community and by the courts is a welcome development, the challenge of harmonization with common law remains a key challenge. What sets customary law apart, that enhances the chances of compliance, is that it is centred on achieving consensus and reconciliation, through discussion and consultation.

> The impact of record-keeping on the course of history cannot be overstated. For example, the act of preserving Judaism and Christianity in written form enabled both to outlive the plethora of other contemporary religions, which were preserved only orally[14].

The current author acknowledges we now live in the communication age, and customary law will now thrive and develop if it is not limited to the space of oral transmission, but reduced to writing. Communities should develop sets of rules as a way of developing customary law.

3.4 Need for a textured approach

In one of his writings, Prof Ben Cousins (2008) in a book entitled Land, Power and Custom: Controversies generated by South Africa's Communal Land Rights in Chapter 5 – Characterising 'communal' tenure: nested systems and flexible boundaries, writes, "The exercise of any right was always limited by obligations and counterbalanced by the rights and privileges of others. Individual security was great, provided that the necessary respect for the ethical code of the group was maintained. Effective use and appropriation were generally required for the maintenance of individual and family rights in a particular piece of land." What this point highlights are that that no amount of simplification will justify any one of these differing perspectives.

William Beinart (Macintosh *et al.*, 1998 cited by Cousins, 2008), writes, "Individual family rights seemed to be very strong over residential sites and adjacent gardens. Arable fields, usually situated at some distance away, were also held securely by families although there were certain conditions under which

[14] https://aeon.co/essays/how-blockchain-will-revolutionise-far-more-than-money?

they could be forfeited". On the contrary it is one of the legal cornerstones which shaped the course of evolution of communal tenure in many parts of the former Transkei.

To think that customary law will be a panacea for many of the problems would be rather naïve, as Peires (2014:19) in relation to Nhlapho Commission;

> However, the Nhlapo Commission, marginal though it may be to more significant national concerns, affords us a prism through which to view the dangers posed by the nebulous and solipsistic references to 'customary norms and criteria' that appear too often in the Framework Act. Although the mantra of 'custom' is frequently invoked as a universal panacea to solve all problems and cure all ills, the experience of the Nhlapo Commission shows the extent to which it serves as a mask, or even a blunt instrument, to facilitate outcomes that are the very reverse of customary.

In this context these different types of rights operate in ebbs and flows, depending on the season, climatic conditions, population size demands, etc. No one household could claim to have exclusive individual land rights to a piece of arable allotment that is not subject to the rights and controls of the wider community. This difference of opinion is typical to communal land tenure landscape and a reflection of the complexity, shifting lines/conception and the complexity of the nested nature of rights in these systems. Perceptions of land rights have remnants of customary perceptions that are mixed up with colonial common impositions, layered with notions of 'justice' which crept in during the democratic transition process have resulted in distortion of long-standing land tenure practices and conceptions. This mixed bag of conceptions about land tenure is not made any easier by the absence of overarching policy guidelines.

The perspectives of dominant outsiders, in the form of government officials or consultants, which are inevitably likely to be tainted with Western notions of rights, use and ownership, is likely to be a big challenge, which will continue to reinforce itself. A fine balance has to be found between development of local normative rules using the customary law anchor and balancing that with use and enhancement of common law. This approach is more consistent with community-oriented catchment management approaches. See Manona, 2008 for some lessons in developing a local land register and set rules in Thaba Nchu. More recent experiment in this regard is in Manona (2016) for a sample of rules developed in Shixini, Willowvale (work in progress).

4. LAND ADMINISTRATION

Prior to 1960, the households in the study area were settled in the typical scattered clusters in which homesteads were closely attached to their arable lands including fields (*amasimi*) and grazing (*amadlelo*) lands were constituted by both patches of commonages in-between settlements and further afield. During this period land in the form of all the three categories of residential, arable and grazing, was held under customary tenure system. But all this changed with the implementation of betterment planning which was implemented unsystematically from the early 1960s, right through to the late 1970s. Betterment planning consisted of government programmes to combat erosion, conserve the environment and improve agricultural production in the homeland areas. Betterment areas were to be planned on the basis of economic units, designed in such a way that households should have access to an amount of arable land and grazing that would provide it with a set minimum annual income. The Betterment planning project involved spatial re-organization of land into distinct zones of residence, crop cultivation and livestock grazing. Where Betterment was implemented fully it resulted in relocation of households to planned settlements.

In terms of Proclamation R188 of 1969, two forms of tenure were recognised − quitrent for surveyed land[15] and 'Permission to Occupy' (PTO) for unsurveyed land. For the latter, chiefs and headmen were to undertake the task of allocation, agricultural officers to survey the boundaries of sites and fields, and magistrates to issue PTO certificates. Registers of permit-holders were to be kept at the magistrates' offices. The manner and degree to which these formal requirements were implemented varied across the catchment area. The PTO system was implemented unevenly in different parts of the catchment.

The institutional arrangements as well as the system through which PTOs were issued started to collapse from around 1996. Magistrate's offices no longer took part in the system of administration of the PTO systems. The officials of the then Provincial Department of Agriculture were at different points also removed from this function and the function constitutionally fell under the then Department of Land Affairs (DLA). Many of the PTO records are kept in conditions which are not ideal in different offices of the Department of Rural Development and Agrarian Reform.

Land administration were constantly identified as some of the biggest hurdles for development in the region (Phillip *et al.*, 2014; Adams *et al.*, 2000). The Integrated Wild Coast Development Programme (IWCDP) Diagnostic Report highlights, land administration in former Bantustan areas such as in the Wild Coast as largely collapsed during the transition to democracy between 1994 and 2000. Effective public land administration and the recording of land rights is a necessary but not sufficient condition for security of tenure.

In the interim, because the land is still nominally owned by the state, various decisions in respect of the land have legal status only if they are taken by the Minister as trustee or nominee. These decisions relate to matters such as township development, subdivision, granting of servitudes, leases, mortgages and sales. Furthermore, decisions taken must be consistent with existing laws. For example, they cannot undermine rights such as those set out in the Interim Protection of Informal Land Rights Act, 31 of 1996. In situations of group based, communal and/or tribally based land rights the members of the relevant group, community or tribe should be treated as the co-owners of the land, even though formal legal ownership may be held by the State. Any decision in respect of ownership issues is valid only if it reflects the views of the majority of "co-owners". A critical feature of this policy is that the rightful ownership of communal land vests in the members of the group which holds the land.

The unfortunate situation is that the state has not yet promulgated the proposed legislation as directed by the Constitution. This results in a situation where land rights holders in communal areas are having very insecure tenure rights. The occupation, use and access to land is not backed up by any form of recognized public record or written contract. If left as it is, this state of affairs is going to create a number of challenges at various stages in the unfolding of the process. During the preconstruction phase, absence of land records is going to create a very complex environment for the process of negotiation and subsequent acquisition of rights. During construction, conflicts are inevitable, which could result in litigations, which could hold the process at ransom, at a high cost. Post construction, the absence of accurate information on land rights is going to make the task of the Proto CMA that much more difficult in promoting appropriate land use practices within the catchment. The principle is that "if you do not know it, you cannot manage it" is important in this regard. The land information system is therefore a critical data system to inform future catchment management strategies.
While there are strong arguments in favour of recordal of right, the recordal system has to be a pro poor system. The unfortunate part is that the policy and legal system does not make this mandatory. It can be reasonably assumed that the process of recordal of rights is likely to be embraced by the communities and traditional leaders because it is in the living memories of people.

[15] The extent of prevalence of quitrent tenure in the catchment could not be quantified in this current study, but early indications suggest that there is either no or very little quitrent tenure on the catchment.

4.1 Land Administration and the proposed construction of the Ntabelanga and Laleni dams

Land administration makes it possible to register a range of different tenure rights using the available information systems, records, technical processes, registration procedures, etc. All legally recognised land rights must be equitably administered, whether such rights are in terms of the Deeds Registries Act (Act 47 of 1937), Interim Protection of Informal Land Rights Act (IPILRA, Act 31 of 1996), Extension of Security of Tenure Act (ESTA, Act 62 of 1997) or any other old or new order laws. (MDS, 2005) Land administration is critical for both the initial phases which relate to negotiation of land rights which is a prerequisite for the physical development to happen. In this regard, public land records will enable government to know who to negotiate and contract with.

In communal areas the rights are not simple one-to-one relationships between spatial units and social units, but rather bundles of rights that are linked to bundles of rights holders in rather complex ways. The simplistic registration system which mimics the Deeds Office registration system, will not work in these 'communal' contexts because one cannot simply match up a parcel and a legal person in a one-to-one relationship. The residential and arable plots are more clearly delineated and connectable to 'family bundle of rights', but one can argue that layered rights in common resources are part of the overall bundle of rights. There are multiple levels of the spatial and social units which are interlocked. For this reason, it is a huge challenge to change conventional mindsets and it hard to actually do achieve this 'flexible recording' in practice. Nested rights are very complex to capture.

4.2 Land Administration in Catchment Management

It is common course that if the negative environmental impacts on the catchment are not managed, the lifespan of the dam will be severely reduced, due to resultant silting. At another level land administration is important for planning by both the municipalities as well as the Proto Catchment Management Agency (CMA). Land administration information provides household level information for development of appropriate strategies which will include, but not limited to;

- Village greening – the role of ground cover
- Fuel/fire management in a catchment
- Biodiversity management
- Invasive and alien plant management
- Sustainable wetland utilization and management
- Livestock management
- Cultivation practices, etc.

The general lack of clarity about the status of such land tends to create serious disputes in such areas, which are typically triggered when a change in land use or a development is proposed. While many of such disputes are among members of the communities they also tend to degenerate into a conflict over power and authority between government and traditional leadership and some sectors of the communities.

It is understood that the Proto Catchment Management Agency will handle the development and implementation of Catchment Management Strategies. One of the key proposals advanced in this for a land rights inquiry of individuals and groups holding rights on communal land within the catchment to be conducted. The immediate need for the land rights inquiry is to document the various layers of rights. Key to most catchment management strategies will be underlying attempts to steer human behaviour away from some of the more established practices, towards a planned ideal. The biggest challenge for the catchment management is that use of common law enforcement and regulation will not work, if those are not embedded in people. In a nutshell, packages of incentives will be required to facilitate change. For example, the CMA may want to promote certain types of rainwater harvesting techniques, it may

want to promote conservation cultivation techniques, it may want to control livestock numbers and rations etc. All of these will have to be embraced rather than imposed from outside.

4.3 Land administration and planning

With Spatial Planning and Land Use Management Act No. 16 of 2013 (SPLUMA) now being a reality (post-July 2015) and the rolling out of wall-to-wall land use management schemes, there are a number of things that need to be resolved in the rural context as they will manifest in the communal parts of the Umzimvubu Catchment. SPLUMA provides one source of law to make land use plans legally enforceable. The first challenge is how the Local Municipalities will be able to implement and manage land use schemes and applications on a wall-to-wall basis. The second key challenge arising from the SPLUMA dynamic is how to carve out land use management functions between communities, Traditional leaders and municipalities. Although SPLUMA has progressive elements, the coming into effect of the law has been subject to a lot of controversy and debate.

> The powers of traditional councils in relation to planning and land use are governed by regulation 19(1) and (2) of the SPLUMA Regulations, which read:
>
> "19 (1) A traditional council may conclude a service level agreement with the municipality in whose municipal area that traditional council is located, subject to the provisions of relevant national or provincial legislation, in terms of which the traditional council may perform such functions as agreed to in the service level agreement, provided that the traditional council may not make a land development or land use decision.
>
> (2) If a traditional council does not conclude a service level agreement with the municipality … that traditional council is responsible for providing proof of allocation of land in terms of the customary law applicable in the traditional area to the applicant of a land development and land use application in order for the applicant to submit it in accordance with the provisions of the Regulations."

These provisions provide that a municipality can conclude an agreement with a traditional council which would allow a traditional council to take over some of the land planning and land use powers and functions that are vested in the municipality (as long as the traditional council is not empowered to make a decision in relation to land planning and land use). In cases where the municipality does not conclude this type of agreement with a traditional council, the traditional council would be required to provide proof of land allocation in terms of customary law. This means that where catchment management activities are to be implemented that could constitute land development or restrictive land-use e.g. gully rehabilitation or grazing exclusion, that the Municipality is the decision maker. However, this then triggers additional challenges to the land tenure and rights conundrum.

Part of the answer (in most rural settlement areas / under certain conditions) definitely lies in getting agreement to applying a set of rules / principles that can be applied on an activity to activity basis in pre-determined zones and which need to be designed / formulated to achieve sustainable development / resource use practices including catchment management activities.

4.4 Why is land recordal important in this context?

UN FAO has initiated and developed the voluntary Guidelines for Governance of Tenure (VVGTs) in terms of which it recommends that states, where possible, should ensure that publicly held land tenure rights are recorded, together with tenure rights of indigenous peoples and rights of the private sector in a single, or at least linked, land record system. The Voluntary Guidelines commit States to the following principles, to;

- **RECOGNIZE AND RESPECT** all legitimate tenure rights and the people who hold them.
- **SAFEGUARD** legitimate tenure rights against threats.

- **PROMOTE AND FACILITATE** the enjoyment of legitimate tenure rights.
- **PROVIDE** access to justice when tenure rights are infringed upon.
- **PREVENT** tenure disputes, violent conflicts and opportunities for corruption (UN FAO, 2012).

Evidence from the large number of tenure problem cases brought before the then Department of Land Affairs is that the underlying land problems tend to emerge strongly when development planning begins or investment projects are proposed (Cousins *et al.*, 1999). Given the legal gaps in tenure legislation, it can be expected that government will not be able to be consistent to the varying land interests.

An appropriate land administration normally marks the starts of land-related conflict resolution and subsequent sustainable land use planning and natural resource management (Lemen *et al.*, 2015). In the case of Umzimvubu it is expected that there are boundary disputes between some administrative areas. It is only when these are known and noted that they can be resolved. It provides evidence/proof of land rights including of the transaction/s, of the parties involved, of the land involved, of the acceptance by the community (Zevenbergen *et al.,* 2012).

It provides information to the public, thereby enhancing the level of status of rights in the eyes of the state, and also enhancing security. Land records provide information about the relationship of the parties that have rights, linking parties to parcels of land and also provides a library of evidence. It increases predictability and efficiency by reducing *ad hoc* land related activities by the state. In the case of the dams it clarifies parties to negotiate with, for different spaces. Land recordal decreases some of the conflict over land by increasing predictability. The land records themselves would contribute to better local dispute resolution mechanisms in general.

5. KEY CONTEXTUAL ISSUES TO BE MANAGED

The Eastern Cape Green Paper identifies four key context specific challenges, those being, (i) spatial jurisdiction and non-alignment, (ii) administrative discontinuities, (iii) institutional and jurisdictional competition, and (iv) vertical and horizontal misalignment of spheres of government. This report does not make proposals on those but raises them as issues to be managed.

Spatial jurisdiction and non-alignment

The demarcation of Municipal Wards appears to have ignored the established boundaries of the AAs. For instance, a single AA may be divided and parts combined with parts of a number of other Administrative Areas into a Municipal Ward. There are numerous examples of this, but to illustrate the point, an evaluation of six coastal Local Municipalities in the Eastern Cape, Mbizana, Ingquza Hill, Port St Johns, Nyandeni, and King Sabata Dalindyebo (KSD), indicates that there is no alignment at all between ward boundaries and AA boundaries. Moreover, there are 11 instances of AAs being split into two Local Municipalities. Complicating the picture of spatial disjunctures, the boundaries of District Municipalities also ignore the boundaries of Magisterial Districts. (Umhlaba, 2015)

5.1 Administrative discontinuity

Possibly extending the point made above about the non-alignment of (still existing) magisterial districts and newly demarcated municipal boundaries, it is also important to note that, prior to 1996, the magistracy at the centre of each (magisterial) district played a key co-coordinating and administrative function, including dealing with communications and requests from the AAs. This arose out of the

practice established in the colonial period of appointing "native commissioners" as executive officers of government in each district.[16]

Commencing in about 1996 and in parallel with the restructuring of local government and the extension of uniform institutions and systems of municipal government across the RSA, the Department of Justice determined that judicial officers should no longer perform wider administrative functions. Some of these functions were not transferred to appropriate line functions but simply ceased to exist.

5.2 Institutional jurisdiction and competition

Today, Section 20 of the *Traditional and Local Government Framework Act* (TLGFA) provides that national or provincial government, "through legislative or other measures" may provide a role for Traditional Councils and traditional leaders in respect of inter alia land administration (Umhlaba, 2015). Importantly, as noted above, in terms of S28(4) of the *TLGFA,* Tribal Authorities established in terms of the 1951 *Bantu Authorities Act* were deemed to be Traditional Councils.

These situations point to the urgency of confronting challenges within the local governance sphere in a manner that is specific to the particular legislative and institutional history of the EC, and, most immediately, with regard to developing capacity of local municipalities and allied institutions to engage progressively in planning and land use management to deal with such situations.

5.3 Horizontal and vertical misalignment of jurisdictions of spheres of government

Administrative or executive functions (as opposed to legislative functions) are assigned by the competent legislatures to various spheres of government and to the institutions set out in Chapter 9 of the Constitution. Because land is fundamental to a wide range of administrative functions, administrative functions involving and affecting land are located across all spheres and institutions of government (Umhlaba, 2015). The complexity is illustrated by an ongoing problem when assigning or delegating legislation in that many past and present laws contain provisions which should be the functional responsibilities of different spheres.[17] To the extent that the national Department of Land Affairs and now the Department of Rural Development and Land Reform (DRDLR) has failed to address issues of rural land administration in former Bantustan areas, this has multiple impact on the abilities of both provincial and local government to fulfil their wider mandates of public administration.

6. OVERARCHING RECOMMENDATIONS

6.1 Initiate a land rights inquiry

The author recommends that a comprehensive land rights inquiry of individuals and groups in the catchment to be undertaken. This should entail a detailed investigation of configurations of land rights in a prescribed area. It is critical that local land registers are developed in order to identify individual household as well as groups of land rights holders and map out the associated spaces. From the catchment management point of view, different parts of the catchment have different challenges which will require targeted approaches on the part of the CMA to synchronise the strategies across the maize of institutions.

The specific objectives of the proposed rights inquiry project are to;

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[16] In the Ciskei, the offices of magistrate and "native", later "bantu", commissioner were combined in the same person. In the Transkei a commissioner was appointed for land administration within each district magistrate's office.

[17] "In many instances the unravelling of the functions of the different spheres of government involved in the administration of a single law is only possible after a legal opinion has been obtained." (Public Services Commission, 2003, *Report on the evaluation of land administration in the Eastern Cape,* page 37)

A. Compile land registers of various categories of land rights holders and capture the data on reputable electronic information system such the Social Tenure Domain Model (STDM) of the UN Habitat.
B. Identify individuals and groupings whose rights will be adversely impacted by the various proposed developments, and make recommendations on how rights should be acquired. Produce a report that details and maps out how the land processes should be handled.
C. Identify and record any latent tenure or boundary disputes and overlapping rights within the catchment area.
D. Identify and analyse the implications of all land administration legislation that that is applicable to the various land right within the catchment. Make recommendations on how to resolve challenges identified.
E. Set up a system for the future maintenance and updating of land records.
F. To set up a land information system that will in future inform the development of land use management plans (SDF) that are consistent with catchment management strategies.
G. Identify the rights, roles and responsibilities in the tenure system with regards to implementing sustainable land management practices.

6.2 Land rights inquiry – Implementation guidelines

Ordinarily a land rights inquiry will consist of two components, an analytical report and a quantitative report. The analytical report provides an overarching analysis of social, legal economic issues, while the quantitative component provides predetermined survey household survey data. It should be a requirement that data is all digitized via Social Tenure Domain Model (STDM). The STDM is a prototype Land information management system that is based on an open source database with open GIS software, a multi-partner initiative of UN HABITAT, the Global Land Tool Network, the World Bank, the International Federation of Surveyors (FIG) and ITC. Its development started in 2005 with the conceptual scheme and functional and technical design. A first prototype was presented at the FIG Congress in Sydney, Australia, April 2010. The system is GIS linked and is designed on the model shown in Figure A-2.

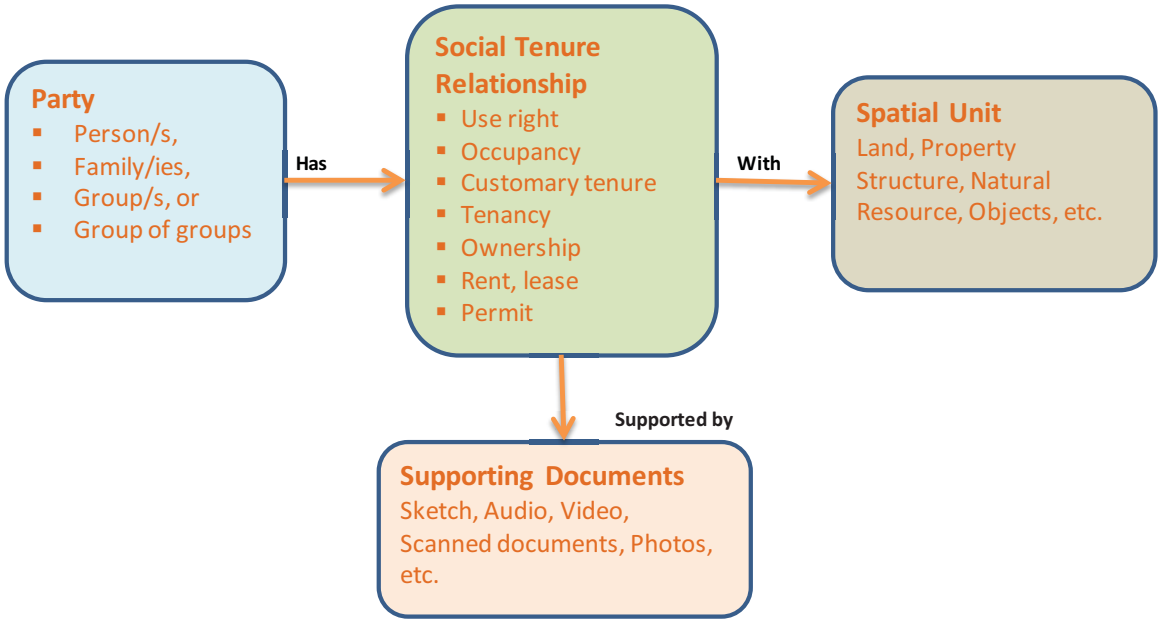

Figure A-2: STDM conceptual model

To populate the system a household survey questionnaire would need to be designed to collect data. When the household data is computed it can produce agglomerated reports for various quaternary and administrative areas. The supporting documents (library of evidence) that would be collected include copies of maps, PTOs, photographs, copies of identity document of rights holder, written or voice recordings of agreements entered into. Given the potential role this system could play in developing catchment management strategies, the survey instrument would include requisite household data such as cultivation practices, rain water harvesting practices, lives stock ownership, etc. One of the key elements that will need to be built into the system design of pro-poor is that the land information system would have to be anchored at the most localised level possible, i.e. at community level, to improve the accuracy of the records and their accessibility, with data backed up in a server at a catchment level.

Risk of the Project for the land rights inquiry

Risks	Mitigation
It could potentially provide an opportunity for the powerful and informed people to manipulate the system for their own gain (or for the gains of their relatives and friends) if not done appropriately because these people know how the system operates.	Speed up land rights inquiry in relation to land impacted by infrastructure. Validation system
Issues of compensation will start to arise as soon as the construction is set to continue, and at that there will be very complex land tenure claims and counter claims which will be very difficult to unravel in the context of pending payments.	It is therefore considered prudent to record the rights first without the complications of compensation. If disputes are not clarified and resolved in time, these are likely to result in contractors being stopped and possible litigations. A compensation framework, agreed in advance would be a useful instrument.
The actual dams and the associated infrastructure are not only going to take away land from the people, but other challenges of access will come to the fore. Where people used to cross a valley, will no longer be possible, with the dam water. Different households and different neighbourhoods will be impacted differentially by the challenge of access.	Identify such factors and include them in the negotiations.
The current state of land records is an important area to understand, in any attempt to set up a land administration system. Many of the land records are not in official archives and are in inadequate facilities in various offices in the different magisterial districts.	Identify location and condition of land information. Scan information in meaningful configurations.

6.3 Development of local rules

Rules development – Implementation guideline

A case for the development of local rules anchored in customary law has been made above. Initiate a process of development of local rules that are anchored in living customary law principles. A key issue here is: whose voices speak up and make themselves heard within processes that determine the content of the 'living law' of land? (Cousins *et al.*, 2011)

There is a massive body of international experience in respect of development of a local land recordal system. There are also some local experiments from which one could draw methodological approaches

from pilots run in the Living Land Laws of Msinga and work conducted Sterkspruit and Willowvale by Umhlaba Consulting Group (Manona *et al.*, 2016).

Key to the development and documentation of local rules is a need to build into the rules systems for mediation and conflict resolution, refer Table A-1 and Figure A-3.

Lessons in this regard can be drawn from Manona (2008) and Manona (2015) and Manona (2016) which are reports of similar work undertaken in Thaba Nchu, Sterkspruit and Willowvale, respectively.

Table A-1 Risks in relation the rules development

Risks	Mitigation
It is going to take time to develop rules.	Focus on critical elements related to catchment management first and expand later.
Enforceability of local rules.	Initiate enforcement mechanisms using magistrate's courts where required and feasible. Sufficient case law should be developed in this regard.

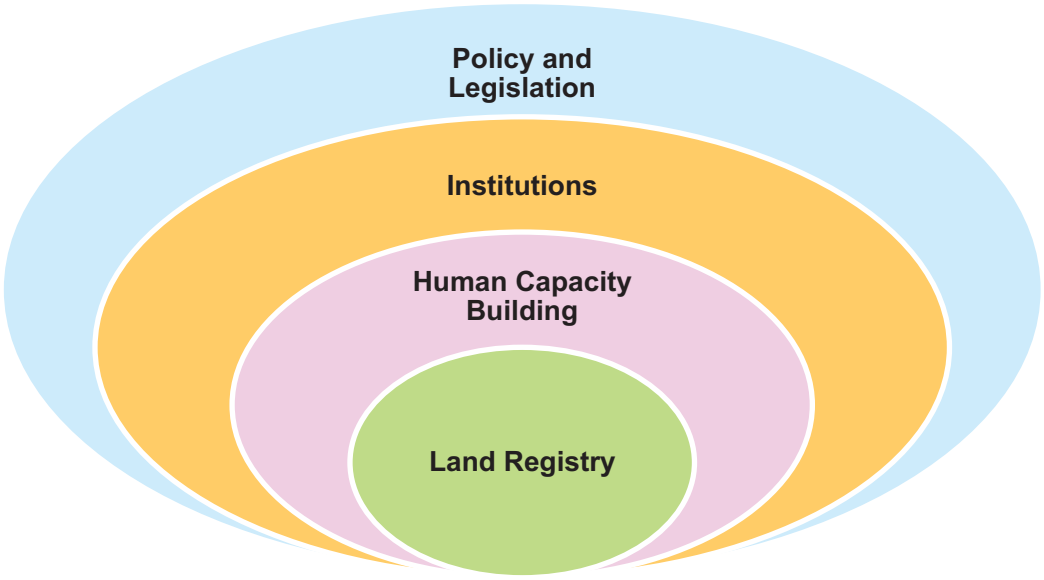

Figure A-3: Multi-layered approach

A recent study conducted by HDA on Communal Tenure does "not endorse the assumption that land administration is the concern of the Department of Rural Development and Land Reform (DRDLR) alone." Although 'land affairs' in the broadest sense is a national function under the jurisdiction of the DRDLR, that does not mean that land administration, which involves multiple sectors at the local level is solely the responsibility of DRDLR. Land and land related functions are transversal across all spheres and most functions of governance. Land use planning, land development, environmental concerns and revenue/taxation on and from land cut across several departments (Kenyon *et al.*, 2015).

The main role players are

- Department of Water and Sanitation (DWS) and the Proto CMA.
- Department of Environmental Affairs (DEA)
- Department of Rural Development and Land Reform (DRDLR)
- Department of Agriculture Forestry and Fisheries (DAFF);
- District municipalities
- Local Municipalities

7. CONCLUSION

The report is a broad brush which seeks to paint a picture of the complexities of land tenure and land administration within Umzimvubu water catchment in the Eastern Cape. While the report tried to make high level proposal or recommendations in terms of what is to be done, it also raises complex questions which are beyond the scope of this report to propose solutions to.

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APPENDIX B: SUMMARY OF PREVIOUS PROJECTS REVIEWED

POLICY REVIEW

Land ownership policies

Various political and administrative hurdles in the Eastern Cape have meant that land ownership, and inherently land use has been an important issue in managing the landscape. In the former Transkei the traditional settlement patterns, of scattered rural dwellings over the landscape, was consolidated into more defined villages, while cropping and grazing areas were demarcated and fenced off according to government policies in the earlier part of the century. As described above, this "Betterment Planning" resulted in defined property boundaries without consideration of traditional settlement patterns. This has left a large area of "state land", which is not necessarily managed effectively.

Currently the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) is coordinating the Integrated Wild Coast Development Programme (IWCDP) on behalf of the Eastern Cape Provincial Government. The strategic framework ensures a holistic approach to socio-economic development in the eastern part of the province and aims to break the poverty trajectory of communities. The headline areas of focus are: "Put the Future First" (including Early Childhood Development, Health and Education), "Get the basics Right" which focusses on systemic issues such as land tenure, infrastructure and water and sanitation among others, and "An Integrated Approach on Public Employment Programmes (PEPs)". During the current phase of the Mzimvubu Water Project a number of visits to communities in the Wild Coast were conducted. Land tenure and land administration were constantly identified as some of the biggest hurdles for development in the region. A project is currently being run by Phuhlisani to develop a local land register in order to identify land rights holders.

Agricultural/Land management policies

In general, the DAFF has focused on private farming, with limited focus on communal farming practices. Policies developed in the 1960s for the Transkei, and 1980s for the Ciskei were almost identical in the aim to provide for the conservation of soil, veld and water resources; with enforcement usually being through expropriation of land or payment of penalties (Lent, Scogings, & van Averbeke, 2000). Over this time the state provided soil conservation schemes, however these are less visible nowadays.

The current national policy for agriculture is the Conservation of Agricultural Resources Act (CARA) 43 of 1983. The objective of the CARA is to provide for the conservation of natural resources for the purposes of agriculture, including protection of the production potential of land, the integrity of water sources, and the control of weeds or alien vegetation. This Act therefore provides an important foundation for the protection of natural resources in agricultural production systems. Following CARA there have been additional legislation and policy documents which have re-directed focus to broader areas related to sustainability (Musvoto, Nahman, Notje, de Wet, & Mahumani, Agriculture and the green economy in South Africa: A CSIR Analysis, 2014).

The Agricultural Research Council (ARC) is a public entity established under the Agricultural Research Act (Act 86 of 1990, as amended). The ARC has a primary mandate to drive research and development in order to promote agriculture and related industries; contribute to a better quality of life; facilitate or ensure natural resource conservation; and alleviate poverty. In terms of NRM, ARC focuses on soil, climate and water through agro-meteorological network, land type surveys, satellite image databases for natural resource and disaster management; and plant protection through national collections. The Research and Innovation Systems division of the ARC supports the strategic goal of enhancing and conserving natural resources.

Environmental / Biodiversity policies

The National Environmental Management Act (NEMA) of 1998 (Act 107 of 1998), as amended establishes the concepts of participatory, cooperative and development governance in environmental management. Various associated acts, regulations and policies are important in the management of natural resources. The DEA has the following programmes which relate to NRM:

- *Climate Change*

The National Climate Change Response White Paper (2011) identifies the challenges that will be faced by the DEA in terms of managing natural resources under the pressures of a changing environment. The DEA response is to develop a National Climate Change Response Policy, Adaptation Framework and Adaptation Sector Plans; as well as facilitating "working for" programmes (water, forests, ecosystems, wetlands, fire, land, coast).

- *Biodiversity and Conservation*

The purpose of the Biodiversity and Conservation programme is to promote conservation and sustainable use of natural resources to contribute to economic growth and poverty alleviation. This is achieved through management of protected areas, regulation/policies and the development of tools for management.

- *Environmental Sector Programmes and Projects*

The purpose of the Environmental Sector Programmes and Projects branch of the DEA is to create conditions for effective corporate and co-operative governance, international co-operation and implementation of expanded public works projects in the environment sectors. These programmes are heavily job-orientated, and are mainly focused on the amount of jobs they provide. From an NRM perspective these contribute to improving socio-economic benefits within the environmental sector and limited restoration of selected ecosystem services.

The DEA is responsible for implementing the Environment and Culture Sector Programme as part of a Government wide Expanded Public Works Programme (EPWP). The Expanded Public Works Programme of the Environment Sector is made up of the Environment Programmes and Infrastructure Projects (EPIP), the Working for Water, Working on Land and Working on Fire programmes. These programmes enable the Department to address a number of environmental management challenges and related infrastructure development, whilst creating employment and skills development opportunities.

The DEA has also recently launched the Environmental Sector Local Government Support Strategy. This strategy provides a platform for a more coordinated and structured mechanism of dealing with sustainable environmental management in local government. The strategy will support government initiatives aimed at advancing sustainable development projects which are implemented at the grassroots level.

Key public entities reporting to DEA which contribute to NRM are the following; specific programmes are summarised in Table B-1:

- *The South African National Biodiversity Institute (SANBI)*

SANBI was established in 2004 in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004). The mandate of SANBI is to play a leading role in South Africa's national commitment to biodiversity management, now and into the future. SANBI leads the biodiversity research agenda and engages in ecosystem restoration and rehabilitation programmes to manage biodiversity, e.g. Working for Wetlands.

- *The South African National Parks (SANParks)*

SANParks was established in 2003 in terms of the National Environmental Management: Protected Areas Act (Act 57 of 2003). The mandate of SANParks is to oversee the conservation of South Africa's biodiversity, landscapes and associated heritage assets through a system of national parks. Programme 5: Provide biodiversity and climate change adaptation policy tools and advice in support of South Africa's development, had significant projects focusing on NRM:

- *The Isimangaliso Wetland Park*

The Isimangaliso Wetland Park has been inscribed in the World Heritage list and has been described as an area of exceptional and outstanding universal heritage significance. This park is an example of an open ecological area with a key focus on community development and benefit.

Water policies

Although the DWS is essentially a services-driven department, it is still necessary to work with the environment in order to ensure sustainability of water resources. The aim of the DWS is to ensure the availability of water resources and sanitation services, facilitate equitable and sustainable socio-economic development, and ensure the universal access to water services.

The Strategic plan for the DWS (2014/15 to 2019/20) states the following strategic objectives, relevant to water resource management:

- *Water Infrastructure Development*

The DWS intends to increase investments in bulk water infrastructure within the 2017/18 fiscal year. The Mzimvubu Water Project has been proposed as an infrastructure investment plan for the next 10 years within the case study area of Ntabelanga. The project has had a degree of contention due to it not being considered feasible due to the concern of the high sediment load from erosion in the catchment, but it is currently in the design stage and it has received environmental authorisation.

- *Water and Sanitation Services: Water Sector Support*

In order to contribute to the government's objective of job creation through rural initiatives the DWS wants to implement rainwater harvesting tanks and provide financial support to resource poor farmers in order to provide job opportunities.

- *Proto-Catchment Management Agencies*

Proto-Catchment Management Agencies provide for the protection, development, use and management of the resources at water management area level. The Mzimvubu-Tsitsikamma Proto-Catchment Management Agency is currently being set up.

A key public entity reporting to the DWS is the Water Research Commission (WRC). The WRC was established through the Water Research Act (Act 34 of 1971) following a period of serious water shortage. The primary function of the WRC is to promote coordination, cooperation and communication in the area of water research and development; establish water research needs and priorities; stimulate and fund water research according to priority; promote the effective transfer of information and technology; and enhance knowledge and capacity building within the water sector.

Table B-1 The relevant programmes of the DAFF, DEA and DWS pertaining to NRM.

Department	Programme	Description
DAFF	***Forestry and Natural Resources Management***	*The relevant strategic objectives for NRM include the development of a sustainable environment and to reduce climate changes impacts through the sustained management of natural resources. Although this is outlined as a strategic objective, it is unclear how the DAFF intends to achieve the goal as it seems that most of the focus is on commercial forestry or revitalising irrigation schemes. There is a push to increase the number of hectares of agricultural land, woodlands and indigenous forest. In all the NRM projects it seems that the greatest challenge is budget constraints, with the additional constraints of cumbersome licencing processes and impacts of climate change threatening food production.*
	LandCare	*The LandCare programme has the objective to promote the sustainable use and management of natural agricultural resources, with strategic goals focused on livestock and crops. The programme is being run by the Department of Rural Development and Agrarian Reform (DRDAR) in the Eastern Cape.*
DAFF: ARC – Soil, Water and Climate	***Renewable energy systems for cattle farmers***	*The ARC has furnished smallholder cattle farmers with a biodigester system. The system is fed with cow dung and other organic waste, and produces biogas for energy as well as an effluent that can be used to fertilise crops in fields and gardens.*
	Drought monitoring software for southern Africa	*The ARC has built and launched the Drought Monitoring System (DMS), an open source software package that can be used to monitor and report on drought in southern Africa. The tool will help researchers to produce maps, tables and graphs from freely-available data on drought in the region.*
	Water conservation practices improve yields	*The ARC trials of rainwater harvesting and other water conservation techniques have shown a 40% improvement in yield for both farms and gardens in Limpopo. Overall In-field rainwater harvesting (IFRH) was considered to be the most effective techniques for both farms and gardens; roof water harvesting was also effective for gardens and the Daling plough (specialised plough for clay soils) and mechanised basins (plough designed to rehabilitate veld) proved effective for farmers. The ARC provided formal and informal training in rural communities to promote these practices.*

Department	Programme	Description
	Wetlands on the Maputaland Coastal Plain	*The prolonged drought (2002-2013) and land-use impacts rendered the important wetlands within the Maputaland Coastal Plain vulnerable. The consequences of drought on wetlands are not well known, consequently research was conducted on the spatial and temporal changes in the distribution of the wetlands.*
DAFF: ARC – Mechanisations & Engineering	**Research into drainage systems**	*With funding from the WRC, the ARC is conducting research into drainage systems for South African farms. The aim is to develop technical and financial guidelines to assess various surface and sub-surface drainage systems. By introducing the correct technical and cost estimating procedures to the end user, it assists with optimising the profitability and feasibility of the drainage enterprise at the farm level and protecting our natural resources.*
	Water Resource Management Services for Provinces	*Upon request various recommendations and designs were made for revitalisation of irrigation systems.*
	Development of a rural livelihood water-based funding framework	*A framework was developed by the DWS outlining the new programmes that the DWS should embark on in order to have a significant impact on the betterment of rural people and improve food security.*
	New equipment for conservation agriculture farmers	*The ARC has provided farmers with specialised conservation agriculture (CA) equipment. These included no-till planters and boom sprayers. The donated equipment was aimed at helping farmers adopt CA, which has been slow on the uptake.*
DEA	**NRM**	*Working for Water; Working on Land and Fire*
DEA: SANBI	**uMngeni Ecological Infrastructure Partnership (UEIP)**	*A part of the Ecological Infrastructure programme. The concept of ecological infrastructure represents a new way of looking at much of our biodiversity, attaching value to it and relating it to the national development agenda.*
	Eastern Cape Bioregional Programmes Co-ordination Unit	*Based in East London (hosted by the Eastern Cape Parks Board), to co-ordinate the implementation strategies and action plans for the bioregional programmes within the Eastern Cape.*
	CAPE Programme	*A 20-year partnership of government and civil society aimed at conserving and restoring the biodiversity of the Cape Floristic Region (CFR) and the adjacent marine environment, while delivering significant benefits to the people of the region.*
	Succulent Karoo Programme (SKEP)	*Long term, multi-stakeholder bioregional conservation and development programme. SKEP began as a bi-national initiative between Namibia and South Africa, with the aim of defining a way to conserve this ecosystem, and to develop*

Department	Programme	Description
		conservation as a land-use rather than instead of land-use.
	Land User Incentive	*Using co-funding through SANBI and DEA NRM, a framework was developed to evaluate proposals received under the Land User Incentive programme.*
	Freshwater Programme	***Wetland Inventory:*** *Through a WRC project, developed a tool which provides standardised set of guidance to those interested in mapping wetlands at a systematic, landscape scale.* ***Working for Wetlands:*** *focuses on the rehabilitation, protection and sustainable use of South Africa's wetlands, while contributing to the creation of employment as part of the Expanded Public Works Programme.* ***National Freshwater Ecosystem Priority Areas project (NFEPA),*** *which aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation.*
	Grasslands Programme	*Partnership between government, non-governmental organisations and the private sector to mainstream biodiversity into the Grassland Biome, with the intention of balancing biodiversity conservation and development imperatives in a production landscape.*
	Biodiversity Mainstreaming Toolbox for Land Use Planning and Development	*In partnership with ICLEI-Africa and the Gauteng Department of Agriculture and Rural Development (GDARD). Provides a valuable resource for mainstreaming biodiversity into local government.*
DWS: WRC	***Green Village Projects***	

Note there are no programmes for rehabilitation of heavily eroded land, the key issue in the project area, or preventing the cause of the erosion.

Review of Management Strategies

COMMUNITY BASED MANAGEMENT

The concept of “community based natural resource management” (CBNRM) means different things to different people. In southern Africa its strongest identity is in nature conservation (Turner, 2004), other meanings are sector or resource based, and are defined in more operational terms. In South Africa CBNRM is encapsulated in a range of laws, regulations and programmes distributed over various government departments. Several government departments are practicing CBNRM as an approach without synergy and in most cases with a duplication of efforts (Fabricius *et al.*, 2003).

In general, CBNRM is an indigenous practice rooted in generations of evolving local governance systems (Turner, 2004). Even though the strains of rapid social and political changes are imposing on local structures and systems, some kind of CBNRM continues to function across most of the communal areas of southern Africa. These indigenous systems are considered to be “everyday” or “general” CBNRM institutions. These institutions must address the whole landscape for which they are responsible

for, typically involving land tenure and allocations, as well as natural resource use and management. Governments, and conservation and development agencies, have little involvement with this “everyday” CBNRM.

“Focused” CBNRM usually involves the perspective of community-based nature conservation, community range management and social forestry projects. This type of CBNRM receives the lion’s share of funding, but typically involves far fewer people, landscapes and livelihoods than “everyday” CBNRM. Enhancing this type of CBNRM is a far greater challenge than delivering more community water, forestry or wildlife management projects (Turner, 2004).

This review focuses on the programmes in South Africa which have attempted to bridge the divide between the “focused” and “everyday” CBNRM. In some cases, the programmes are still attempting a “focused” perspective, but in general it is clear that an understanding and respect for the local governing system is key to enable participation, engagement and sustainability of projects.

- **Community Based Natural Resource Management Guidelines (CBNRM, 2003)**

The Transform programme aims to assist rural people to make use of their natural resources in a way that brings tangible (economic) and non-tangible (spiritual and cultural) benefits. In its first phase, the programme aimed to maximize benefits that rural communities could achieve through co-management of protected areas – such as game reserves and national parks. Since 2001, the programme has expanded to focus on a much wider range of community based natural resource management issues.

These guidelines were developed due to need to project a clear understanding of what CBNRM means, and so that all the partners in CBNRM programmes share the same understanding of what a CBNRM programme is, what the technical and process requirements are, and what their different roles and responsibilities are.

Key lessons learnt are as follows:

- **Human Rights:** Allow local residents the right to own their land and make commercial use of the resources that exist on their land.
- **Local Institutions:** There is a need to set up strong and democratic local institutions of governance that are able to partake in businesses ventures, ensure stable forms of administration and distribute benefits in a fair and equal way.
- **Partnerships:** Partnerships with all levels of government, conservation agencies and other relevant organizations are vital to ensure success. In particular, joint ventures with the private sector bring experience and professional to CBNRM projects and also allows skills to be transferred to local people. It is not easy to set up such partnerships and this requires extensive negotiation and conflict mediation – all skills learnt by Transform in the projects.
- **Many streams of benefits:** It is important, in order to overcome high levels of poverty, to find as many streams of benefit for local residents. These can include work and contracts for small businesses, guaranteed jobs in major tourism businesses and skills programmes to ensure that local people take up as many of these jobs as possible.
- **Support not leading to dependency**: Quality technical support to local communities is vital but needs to be provided in a way that does not encourage dependency. Clear contracts and agreements outlining the rights, roles and obligations of the various parties are vital.

- **Smallholder System Innovation Programme (UKZN, 2010)**

The Potshini catchment monitoring network was established to address some of the scientific and developmental objectives of the Smallholder System Innovations (SSI) programme. The main objectives of establishing the Potshini catchment monitoring network were (Kongo *et al.*, 2010):

- Monitoring the hydro-climatological processes of the Potshini catchment in order to gain an in-depth understanding of the hydrological regime of the catchment and investigate the hydrological and ecosystem impacts of adoption and adaptation of water use innovations (e.g. rainwater harvesting, conservation tillage etc.) in the Potshini catchment.

- Establishing a capacity to assess, monitor, and manage water and environmental resources in the Potshini community in collaboration with various stakeholders through training on the basic methodologies of catchment monitoring.

- Providing information to scientists and community members alike on the potential for improved productivity from water resources of the catchment.

- Providing an opportunity for future and further research through the establishment of a catchment monitoring network with a potential for upscaling and integrating into other larger networks in the country. This is due to the fact that the network comprises several permanent structures which other researchers may use in their studies in the future after the completion of the SSI research programme (an aim that is being achieved through ongoing research initiative).

Key lessons learnt are as follows:

- **Respect for Local Governance**: Most rural communities in sub-Saharan Africa are engaged in either agricultural or pastoral activities, and often support or adopt initiatives that are geared towards enhancing their livelihoods. These communities have governance structures of which the leadership and the community at large expect to be recognized and respected by all, including visitors, Potshini is no exception.
- **People are intrinsic, not external**: A key element to understand the hydrological functioning of coupled human-nature systems is to move from a perspective of humans being intrinsic, rather than external to the hydrologic system and to research catchments which are not pristine, but rather reflect the places where humans live and interact and therefore their impacts.
- **Key innovation "champions":** It is recognized that there are always key individuals, with influence, in any institutional set up. These individuals form a network of respected persons in the community whose advice is most often respected by all. One can expect rapid diffusion of an idea to the community if the respected persons take up the new idea and implement it with success. (Not to be mistaken by the loudest voice or political influence).
- **Learning Institutions provide sustainability**: Engaging the learning institutions in the local area has both immediate and long-term benefits
- **Ethics of research in communities**: Undertaking a research initiative in a rural community brings a fair amount of responsibility to the researchers given the lack of capacity in these communities to counter check research findings. This is an ethical issue in science that needs to be given more attention in this context, while at the same time communicating effectively on both complex and simple issues without raising false hopes or raising unnecessary alarms to the community, especially when the research project ends.

- **Okhombe Monitoring Project (UKZN, 2007)**

Through the National LandCare programme, the government made the first step to involving communities in conservation. At Okhombe, a pilot LandCare project was initiated which embarked upon an intensive job creation programme which focused on the rehabilitation of degraded areas in the Drakensberg catchment area (Everson *et al.*, 2007). The basis of LandCare is that land degradation is a community problem and that people will work in groups to encourage land users to assume responsibility for local problems. The main focus of the LandCare project was capacity building and training of community members in the implementation of a number of different erosion control techniques. The LandCare project was highly successful with most of the rehabilitation areas showing clear signs of stabilization. However, one of the biggest criticisms of this rehabilitation work is the lack of quantitative information on how successful the different techniques have been. The development of adequate and appropriate tools to monitor the impact of land degradation and rehabilitation has been identified as a major need to combating soil erosion. The aim of this project was to develop a community-based monitoring system to determine the effect of rehabilitation on reducing soil erosion and run-off and increasing water quantity and vegetation cover in the previously degraded areas.

Key lessons learnt are as follows:

- **Integrative solutions:** One of the main lessons from the project was that social and technological issues must be integrated when developing solutions to environmental problems.
- **Simple techniques for monitoring:** Although sophisticated techniques for quantifying the effects of erosion have been developed, there remains a need for simple techniques that can be used by rural communities to monitor the extent of soil detachment, i.e. see for themselves the benefits and results of the rehabilitation activities.
- **Education can be both social and scientific:** The education and training carried out in this project was both a scientific and a social process, bringing people together, and contributing to the development of the community as a whole.
- **PES requires monitoring:** The initiative by the Maloti Drakensberg Transfrontier project to develop a strategy for the payment of environmental services (PES) in the region has the potential to promote the effective management of these natural resources. The PES strategy will secure the supply of environmental services, particularly water resources, from the area. Identifying the indicators to monitor and certify the delivery of water services will require research at community, local and national levels.

- **Kat River Catchment Management Forum (CRG, 2001)**

The Kat River Catchment Management Forum (CMF) was formed following five years of research into community empowerment in the Kat Valley. A WRC project focused on the “The development and co-ordination of a Catchment Management Forum for the empowerment of rural communities” (Motteux, 2011). This project focused on facilitating the effective participation of rural communities in the Kat River in both the transformation of the Kat River Irrigation Board into the Kat River Water Users Association, and the development of a Catchment Forum. The Catchment Forum was able to take the lead in certain areas, such as the development of a LandCare programme to tackle land degradation. They were able to identify and formulate the proposal themselves, and take responsibility for the process.

Key lessons learnt are as follows:

- **Financial stability in CMAs:** Finances to support grassroots workers need to be built into the system of the Catchment Management Agency (CMA). This is vital because, in South Africa,

there is so little capacity at this level that the workers need to be supported. If a process is built up and then simply dropped, stakeholders become dependent and fearful.

- **Capacity Building:** A process of capacity building is essential.
- **Conflict resolution:** It is important to note that negotiation and mediation during conflict resolution is not a once-off event: as stakeholders evolve, conflicts will arise and will need to be addressed.
- **Responsibility:** In order to allow stakeholders to take on responsibility, responsibility must be given to them**.**
- **Sustainability:** Every Catchment Management Project (CMP) needs to have a long-term goal and cannot be driven by haphazard planning. It is important that stakeholders are included as designers of both long-term and short-term plans.
- **Ethics:** The integrity and efficacy of CMPs depends on their adherence to ethics, participatory principles, self-awareness and honesty.

➢ **Dusi-uMngeni Conservation Trust (DUCT, 2005)**

DUCT originated as an initiative to champion the health of the uMsunduzi and uMngeni Rivers, which came from concerned individuals within the KwaZulu-Natal canoeing community (user of the rivers for recreational purposes). Since the formation of DUCT in 2005 the concerned individuals have expanded to include an array of individuals who are passionate about river health in the region.

DUCT lobbies for a higher priority to be given to any actions and programmes which will improve river health, such as the removal and control of invasive weeds, the improvement of waste management systems, and the implementation of the environmental flow provisions of the National Water Act of 1998 (DUCT, 2013). DUCT is able to provide skills (both knowledge and experience) and manpower to take actions and programmes to their full effect. It monitors river health issues, raises public awareness and provides a ready access to a network of highly experienced professionals with relevant skills. This may be the crux of why DUCT has been so successful, in that the programme was initiated through the passion of a community, a community which happens to have a wealth of knowledgeable experts willing to volunteer their time and effort. The network of highly experienced professionals is able to formulate proposals and manage programmes which are making a difference, and which will continue to make a difference due to effective management and innovative leadership. DUCT embodies the success of community-based natural resource management as defined by Armitage (2005), in that it is run by innovative communities and community-based organisations (Armitage, 2005).

Lessons learnt are as follows:

- **Learn from communities already making a difference:** Support and learn from people and communities who wish to make a difference or are already making a difference to the health of their rivers.
- **Awareness:** Raise the public awareness of river health issues through education of school groups, public campaigns and the use of the media.
- **Employment:** Create employment in areas of unemployment and poverty.
- **Partnerships:** Create partnerships with public and private sector.

- **Network of experts:** Relies on a network of experts, which happen to be in the area and already passionate about the cause. The experts are, in part a part of the community and have a vested interest in the success of the programme.

LAND BASED MANAGEMENT

South Africa has a long history of engagement in soil and water conservation (Department of Agriculture and Water Supply, 1985; National Veld Trust, 1994; Von Maltitz *et al.* 1998), but uptake in rural village communities has been limited and slow. This review focuses on the interventions implemented by the government and civil society.

- **LandCare Australia (LandCare Ltd., 1989)**

The National Land Care Programme started in Australia following a speech by the Prime Minister in 1989, outlining the importance of land care (Youl *et al.*, 2006). The prime minister painted a picture of a world with environmental problems, and a country with similar such issues. He stated that the government was aware of these issues and aware that solutions could only be made through cooperation at all levels: from the government to communities. Soil was identified as the most fundamental ingredient to the natural environment and agricultural prosperity.

The strength of Australian Landcare is that community groups and networks, with government and corporate support, conceive their own visions and set goals for local and regional environmental action. Working from the ground up to achieve these goals creates freedom and flexibility, giving communities a great sense of purpose (LandCare, 2014). By devolving authority to communities, LandCare also strengthens their sense of responsibility. Funds are allocated directly to networks and groups, which meet and disburse funds to achieve specific catchment objectives, set after substantial consultation. The organisational structure of the Australian LandCare programme is important as it is registered as a non-partisan organisation, which receives funds from governments, corporate organisations and private donations (LandCare, 2014).

Key lessons learnt are as follows:

- **Ownership and Responsibility:** In Australia the combined skills, knowledge, financial and technical resources available within the whole community exceed those of government. Government plays a very important but not dominating role in improving land management. By devolving authority to communities, Landcare also strengthens their sense of responsibility.
- **Funding:** Government and corporate finance, is allocated directly to networks and groups, which meet and disburse funds to achieve specific catchment objectives. Progress and completion reports are required, and random audits may be undertaken.
- **Marketing:** A key component of the tenacity of the programme has been the "brand awareness" and marketing campaign. This has meant that up to 8 out of 10 Australians are aware of the brand logo and are aware of the land care programme. LandCare has recently upped their media and PR, and have invested in digital marketing. Currently they use websites, e-newsletters and social media to effectively spread their message.

- **LandCare South Africa (DAFF, 1997)**

The South African Government initiated the National LandCare Programme (NLP) in 1997 within the Department of Agriculture (DoA). The project had the vision of "(being) a community-based programme supported by both the public and private sector through a series of partnerships. It is a process focused towards the conservation of the natural resources…. In addition, it seeks to address rural poverty by means of sustainable job creation." (Nduli, 1998). Responsibility for LandCare was given to the technical Soil Conservation sections of the National and Provincial Departments of Agriculture (PDAs). Holt (2004) describes the consequences of this approach, resulting in a divergence between the vision of LandCare as a community-based movement and the reality of a top down, largely technocratic approach which saw LandCare as a poverty relief mechanism to overcome soil conservation. According to Nabben (2009) there was confusion over what LandCare was i.e. a community-based movement, a funding

programme or another name for soil conservation efforts. Despite these constraints, some projects were very successful (Prior, 2002) and formed the basis of 8 Model Projects, later documented and used by Institutional Strengthening Departments of Agriculture (ISDA) to demonstrate good LandCare practices as part of its capacity building interventions (Nabben, 2004). Other issues impacted negatively on the development of LandCare and subsequent ISDA interventions were highlighted as a transformation agenda within the public sector promoting very high staff turnover and reduced staff motivation and corporate knowledge (in some cases resulting in senior managers with limited management skills); hierarchical and bureaucratic structures; limited resources and multiplicity of duties among departmental staff with some LandCare roles (Nabben, 2004). These all posed challenges to adopting a participatory, community based Landcare approach. The broad objective the ISDA project was to build the capacity of the DoA and provincial Department of Agriculture (PDA) staff to effectively implement and manage the LandCare Programme. This was to be achieved through placing staff in existing and appropriate short courses. The trained staff would assist in establishing LandCare as a community based but government supported initiative with a broad base of public support and involvement at local, regional, provincial and national levels. Increasing the capacity for participatory planning and management of projects at a local community level (via improved departmental capacity) with the aim of building greater community self-reliance was seen as important given a previous history of top down approaches and high levels of dependency in rural communities (Nabben, 2004).

At Okhombe in KwaZulu-Natal a LandCare program was very successful but after the program was finished community members were worried that there would be a lack of interest in rehabilitation (Everson *et al.,* 2007). A failing with the LandCare programme had also been identified as a lack of quantifiable data to determine whether the project had been a success. The aim of a WRC project was to develop a community-based monitoring system to determine the effect of rehabilitation on reducing soil erosion and run-off and increasing water quantity and vegetation cover in the previously degraded areas. The sustainable management of Okhombe was considered to be dependent on the ability of the community to recognise and define problems and to generate and implement solutions in an ongoing, self-driven, dynamic manner. One of the main lessons from the project was that social and technological issues must be integrated when developing solutions to environmental problems (Everson *et al.,* 2007). From the start of the project the community were involved in decision making on topics ranging from short term planning to complex issues. This has led to the ownership of the project by the community.

Key lessons learnt are as follows:

- **Implementation**: It is apparent that although the LandCare concept has been attempted in South Africa, the implementation of it through a government programme is not sustainable due to many administrative issues.
- **Administrative issues in Government Departments:** Although the ISDA attempted to streamline the uptake of the LandCare programme, it was still met with massive hurdles in terms of implementation.
- **Top-down approach / job-driven approach:** Although at first the divergence from basing LandCare as a community driven process was overlooked, in essence this divergence made the uptake or ownership of the concept that much harder and opened the project up to the weaknesses of top-down, largely technocratic approaches where LandCare is seen as a poverty relief mechanism to overcome soil conservation.
- **Sustainability:** The aim of the WRC project was to develop a community-based monitoring system to determine the effect of rehabilitation on reducing soil erosion and run-off and increasing water quantity and vegetation cover in the previously degraded areas. The sustainable management of Okhombe is dependent on the ability of the community to recognise and define problems and to generate and implement solutions in an ongoing, self-driven, dynamic manner.

- **Social and Technological issues:** One of the main lessons from the project was that social and technological issues must be integrated when developing solutions to environmental problems.
- **Ownership:** From the start of the project the community were involved in decision making on topics ranging from short term planning (e.g. date of next meeting, catering) to complex issues (e.g. development of an action plan, selecting work teams, establishing a donga committee). This has led to the ownership of the project by the community.

➢ **Conservation Agriculture in Zimbabwe (Union project)**

Conservation Agriculture (CA) is based on minimum soil disturbance, surface crop residue retention from previous crops or cover crops (mulching) and diversified crop rotations or associations (FAO, 2002). CA has had a growing following internationally for the past 20 years, with many CA projects being run in areas such as Zimbabwe where intensive farming has had a significant decrease (Mazvimavi *et al.*, 2011; Thierfelder *et al.*, 2013). Many NGOs are promoting CA in resource poor, communal areas although adoption of it has been slow. In Zimbabwe there is evidence that CA promotion is associated with free input packages, where farmers are given seed and fertilizer (Mazvimavi *et al.*, 2011). CA was disseminated through NGO's as a "package" with all the necessary components. These inputs influenced the area farmers allocated to CA. The choice to adopt CA was positively correlated with farmer's formal education, access to extension services, labour and animal draught power and land size (Mazvimavi *et al.*, 2011). CA does promote an integrative solution for resource poor, rural smallholder farmers, but with this integration comes complexity as CA is not effective through using only one component. This integration of all the components of CA produces the largest yields but farmers are still risk averse and may "pick" components of CA, without necessarily committing to the whole picture. The challenge in resource poor, rural areas is to ensure that farmers adopt all the components of CA, and not just components that they perceive to be important. CA is most effective when all components are used. This could be solved through a step-wise strategy, without making drastic changes (Figure B-1), or through applying the full CA principles on a small plot of land in order to master the management and resource demands (Thierfelder *et al.*, 2013).

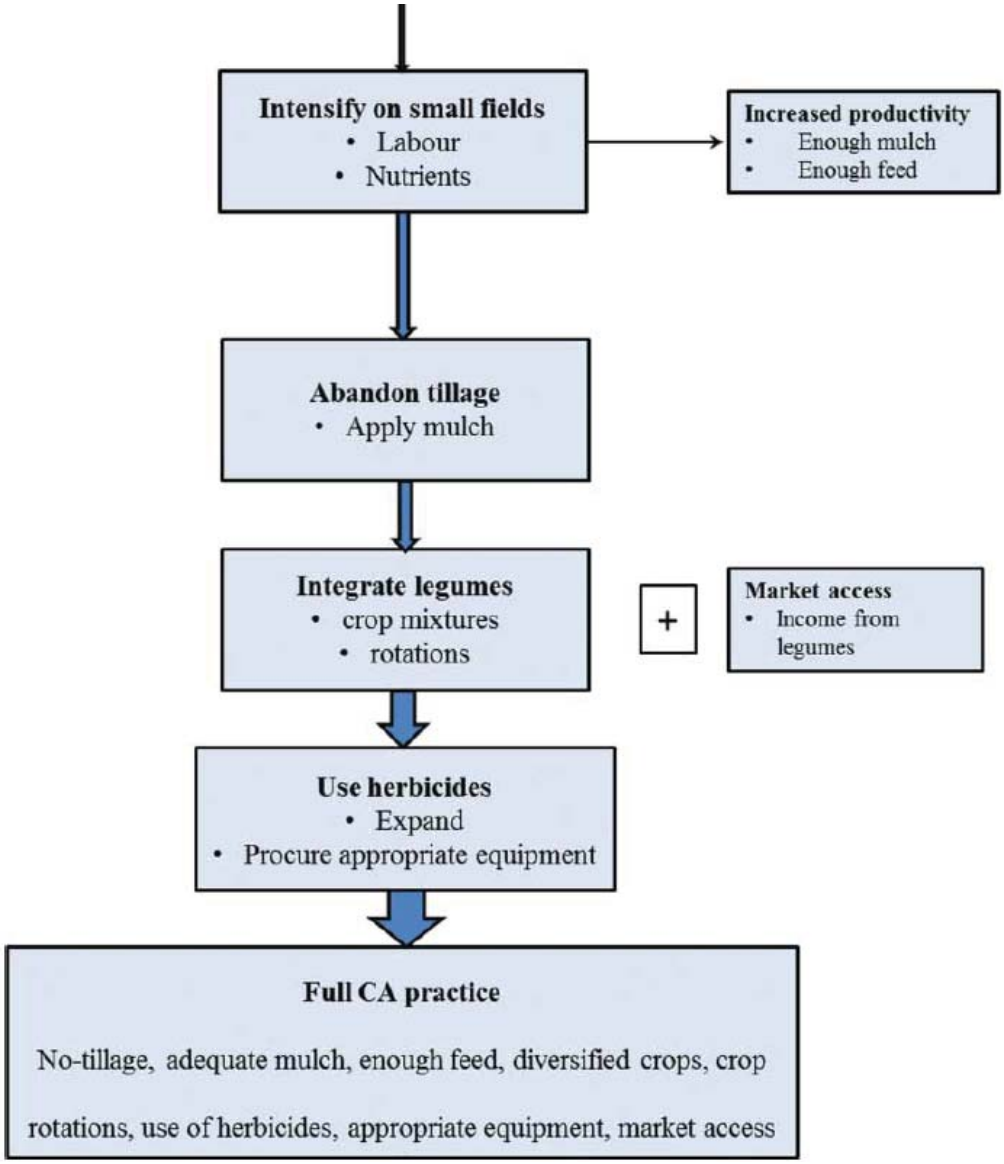

Figure B-1: A sustainable pathway to fulfil the integration of CA in the smallholder farming systems of southern Africa (Thierfelder et al., 2013).

Key lessons learnt are as follows:

- **Uptake by communities:** Introducing new concepts such as CA was considered to be most effective when directed at educated, young farmers. These farmers are less risk averse, and are open to innovation, then demonstrate to others.
- **Perceived benefits:** Implement parts of CA through a step-wise strategy, without making drastic changes, or through applying the full CA principles on a small plot of land in order to master the management and resource demands.

➢ **Farmer Innovation Programme (GrainSA, Maize Trust, SAVEAct, Mahlathini Organics, 2013)**

Conservation agriculture (CA) provides an attractive alternative for smallholders where environmental and economic stresses have reduced grain production considerably. As a result, a long-term project has been launched in two smallholder pilot study areas to investigate and promote the use of CA for

sustainable crop production. These smallholder projects have been funded and established under the umbrella of the new CA Farmer Innovation Programme (FIP) at Grain SA and the Maize Trust, through collaboration between the SaveAct Trust, Mahlathini Organics, the Maize Trust and Grain SA ().

Their aim is to apply innovation systems and processes assisting smallholder farmers in growing maize and legumes using CA practices, with the first study area occurring in Matatiele in the Eastern Cape. The CA-FIP project in Matatiele was formally launched in October 2013 and served the need from Grain SA to establish these projects on vibrant local farmer structures supported by resourceful partners.

SaveAct's primary role is to facilitate and support the establishment of community-based and -managed savings and credit groups (SCG's). According to SaveAct's model, members of the community self-select voluntarily to form a group and save money in the form of share purchases. Savings are invested in the loan fund, from which members can borrow and repay with an applicable service charge or interest. Loans can be used to start small businesses (farming enterprises, tuck shops, etc.), build or renovate homes, or to pay school fees and buy food, etc.

SaveAct's work is based on three phases:

- Setting up and putting into operation the savings and credit groups.
- Financial education.
- Enterprise development.

All three phases include training and ongoing mentoring processes. These groups provide a strong organisational backbone to initiate any innovation process and hence were identified as an ideal platform to launch a CA-FIP project among their smallholder members, in this case focussing on agricultural enterprise development with CA as best practice.

Key lessons learnt were as follows:

- **Financial security:** An important part of smallholder farms is profitability and supplementing income for large families. This means that although food security is important, financial security allows for farmers to buy seed, manage plots and in general be productive.
- **Sharing ideas:** Social capital is being built alongside financial capital.

➢ **PRESENCE Baviaanskloof (LivingLands, 2007)**

In mid-2007, the PRESENCE (Participatory Restoration of Ecosystem SErvices & Natural Capital, Eastern Cape) was launched to identify the research gaps and capacity needed to effectively restore degraded landscapes whilst supporting poverty alleviation and rural livelihoods within South Africa's unique Subtropical Thicket biome (LivingLands, 2012). At the same time, the PRESENCE Learning Village (PLV) was initiated at the Kouga Dam. With the support of Working for Water and Gamtoos Irrigation Board, the PLV became the home of the PRESENCE Learning Network and a research station for visiting national and international students and researchers. To date, over 70 students have used the PLV as their learning space for their Masters, PhD and internship projects.

Living Lands' initial role was to serve as the secretariat for the established PRESENCE Learning Network (LN) (LivingLands, 2012). During the same year, a clear decision was made that the focus of the PRESENCE LN in applying, testing and refining of the Transdisciplinary Assessment & Implementation Framework would be piloted in the Baviaanskloof Catchment. This framework was developed during the first PRESENCE workshop and was the start of the programme PRESENCE in the Baviaanskloof: Integrative Catchment Restoration Programme.

Key lessons learnt are as follows:

- **Trust building:** The PRESENCE Baviaanskloof example has achieved good results by using the LivingLands toolbox. The main benefit of the toolbox is that the LivingLands teams are external to government programmes and they build trust and relationships.
- **Livelihood orientated:** The project does not come with technical solutions but rather viable livelihood options.
- **External facilitation:** The toolbox is made of a Landscape Mobiliser, Knowledge Broker, Landscape Ecologist, and Network Facilitator. These are external parties to the community.

BIODIVERSITY MANAGEMENT

The South African Government has a mandate to ensure society lives in harmony with natural resources, and protects the country's biodiversity heritage for the benefit of all. The implementers of this mandate are the DEA, working closely with other national departments and public entities. Within these Departments recognition has grown that protected areas alone will never be adequate to conserve a representative sample of biodiversity and maintain functioning ecosystems (Cadman *et al.,* 2010). To meet new global challenges, conservation actions need to focus on maintaining ecosystems, and the species assemblages supported by these ecosystems. In essence the landscape approach involves viewing protected areas as a part of a matrix of land uses that maintains ecosystem functioning, and in which biodiversity management objectives are integrated in the strategies, production practices and decisions of a range of land and resource users (Cadman *et al.,* 2010). Connectivity is important in this regard, allowing for movement of species, ensuring representation of ecosystem types and enabling the maintenance of ecological processes. This ecosystem-based approach involves planned adaptation to climate change. It is provided by natural ecosystems, and is often cheaper and more effective than engineering or technology-based approaches.

- **CAPE partnership (CAPE co-ordination unit: SANBI, 2000)**

Cape Action for People and the Environment (CAPE) is a 20-year partnership of government and civil society aimed at conserving and restoring the biodiversity of the Cape Floristic Region and the adjacent marine environment, while delivering significant benefits to the people of the region. The rationale of the CAPE partnership is to create linkages between government, the private sector and civil society so that we all work together with a common strategy, avoiding duplication, addressing gaps and uniting to leverage resources and to tackle agreed common priorities in terms of a shared vision.

Coordinated action is a key strategic objective. Through the Memorandum of Understanding signed in 2001, signatory partners agreed to work together in governance and coordination structures that enable strategic alignment, institutional strengthening and collaborative action. These structures enable active participation by hundreds of people in task teams and landscape initiatives, developing capacity and harnessing effort towards better biodiversity management in a range of sectors and geographical areas.

A key lesson learnt is as follows:

- **Coordinated management:** Projects are managed within the Cape Floristic Region, defined in geographic areas. The organisational structure of these projects is important as this is integral to achieving effective coordination. The CCU supports the governance and co-ordination structures which provide strategic direction to the work of the 23 CAPE signatory partners and oversee the spending of donor funding. Progress is tracked though a monitoring and evaluation system. There are various forms for partners and managers to meet and coordinate work programmes. The projects range from landscape initiatives, protection of landscapes, integrated

management and biodiversity tools for management. These projects are managed at a landscape scale.

- **Table Mountain Fund (TMF: WWF, 1993)**

The Table Mountain Fund acts as a Fund for securing the globally significant Fynbos biome, working with the C.A.P.E. Partnership, and playing a leading role in catalysing priority conservation interventions, both locally and nationally. Coordinated action is a key strategic objective. Through the Memorandum of Understanding signed in 2001, signatory partners agree to work together in governance and coordination structures that enable strategic alignment, institutional strengthening and collaborative action. These structures enable active participation by hundreds of people in task teams and landscape initiatives, developing capacity and harnessing effort towards better biodiversity management in a range of sectors and geographical areas.

Key lessons learnt are as follows:

- **Priority conservation:** The TMF acts as an important fund for priority conservation interventions, both locally and nationally. The fund is able to secure significant funding for projects associated with critical biodiversity areas.

- **Mondi Wetlands Programme (WWF/WESSA/Mondi/Mazda Wildlife Trust, 1991)**

The Mondi Wetlands Programme (MWP) programme was established in 1991 by WWF and the Wildlife and Environment Society of South Africa (WESSA). It is one of the country's longest running privately-funded ecological conservation programmes and the first wetland initiative to focus on the protection of wetlands outside of protected areas. The MWP was also an important part of initiating Working for Wetlands (EPWP/DEA initiative), which began in 2000.

The MWP achieves its outcomes for wetland conservation through the development of strategic partnerships, which are aligned with working together on shared action of common interest. As the Programme is a partnership between two conservation NGO's together with two corporates it is able to work in a catalytic manner to maximise the impact of a relatively small-scale initiative, and to institutionalise its benefits with government, poor rural communities, and the private sector in the hope of sustaining it. The MWP strategically aligned wetlands with water management and the National Water Act (NWA), and successfully demonstrated links between wetlands and people.

Key lessons learnt are as follows:

- **Strategic partnerships:** A key feature of the success of the MWP has been the strategic partnerships developed with government and the private sector. These partnerships are critical in developing a shared vision for a common interest.
- **Alignment with NWA:** The promotion of wetlands as being important for managing South Africa's water resources, not just biodiversity, is an integral component of capturing the attention of influential decision makers such as landowners, politicians and captains of industry.
- **Awareness:** Prior to the MWP ignorance about wetlands resulted in approximately 50% of South Africa's wetlands being destroyed through poor land management. A key objective of the MWP is therefore to create awareness and increased capacity amongst natural resource managers, environmental impact assessment practitioners, regulators and policy makers.
- **Tools:** The MWP have developed a selection of wetland management tools, which have been developed through a collaboration of MWP staff together with partner organisations. Although practical and solution orientated, some tools are complex and require a fairly high level of wetland experience to implement.

- ***Working for*** **programmes (EPWP/DEA: SANBI, DAFF, WESSA, 1995)**

Working for Water (WfW) effectively acts as a conduit for the provision of ecosystem goods and services, predominately water supply, through the control of invasive alien plants and the provision of unskilled job opportunities, using predominantly taxpayers' money (Turpie *et al.*, 2008). DEA runs the programme through the Environment & Culture Sector Plan of the EPWP, which is in turn managed by the National Department of Public Works (NDPW). The programme has an annual budget of R400 million, which in effect acts as the Payment for Ecosystem Services (PES) condition. Although this form of transfer payment does not constitute the creation of a market for the provision of ecosystem goods and services.

Whilst the WfW programme has been hailed as highly successful in terms of its objective of restoring water supply in alien infested catchments (Macdonald, 2004; Hobbs (2004); Mooney and Neville (2000), Woodworth, 2006, Marais and Wannenburgh, 2007), there is still contention in terms of the true value and sustainability of these projects. Costs are very well monitored, but progress in terms of the benefits gained through rehabilitation are limited (Turpie *et al.*, 2008).

Extensions to the programme have attempted to broaden the scope of the rehabilitation strategy by including a Working for Wetlands, Forests, Land, Coasts, Ecosystems and Working on Fire programme. The Working for Water, Wetlands, Land and Working on Fire programmes are implemented by the DEA, with the Working for Wetlands programme being implemented by SANBI, Working for Forests by the DAFF, and Working for Ecosystems by WESSA. These programmes intend to engage in ecological restoration beyond just improving water delivery.

Key lessons learnt are as follows:

- **Catchment scale:** A catchment-based approach is vital due to the close relationship of projects with water supply.
- **Partnerships:** Important to have partnerships working at all levels simultaneously.
- **Sustainability:** Although these projects are run over relatively short periods of time, in reality a long-term investment is needed in terms of securing stewardship and monitoring of the rehabilitated area.
- **Marketing:** Public awareness is important for buy in. This may be achieved through the effective communication during stakeholder meetings, or through awareness campaigns.
- **Research:** Must have strong research and information base.
- **Catalyst vs Funding:** NGOs are important in terms of being the catalyst for a project, but the government is vital for implementation and funding.
- **Water:** Water not biodiversity may be the key to engage with stakeholders.
- **Monitoring:** Monitoring is essential to substantiate efficient use of money.
- **Stewardship:** Stewardship of the area rehabilitated is vital if the project is to be considered sustainable.
- **Exit strategies:** Exit strategies for workers are essential to ensure they do no re-enter poverty. Through the Working for Ecosystems approach SMME businesses have been formed with the sole purpose of Invasive Alien Plant control. This equips teams with business skills required for registration and operation as cooperatives in communities.

- **Grasslands Programme (SANBI, 2008-2013)**

The Grasslands Programme was a partnership between government, non-governmental organisations and the private sector to mainstream biodiversity into the Grassland Biome, with the intention of

balancing biodiversity conservation and development imperatives in a production landscape (Grasslands Programme, 2013). The programme started in 2008, with a large investment from the Global Environment Facility (GEF), managed by the United Nations Development Programme (UNDP) and implemented by the SANBI, the Programme relies on partnerships to mainstream biodiversity objectives into the major production sectors that operate in the Grassland Biome. These include agriculture, forestry, coal mining, and urban economies, as well as the enabling environment.

In the five years of implementation, the grasslands programme has had many notable achievements. Some of these are securing areas important for biodiversity conservation, influencing policies and regulations, strengthening institutional capacity, and catalysing pilot projects that demonstrate biodiversity gains across sectors (Grasslands Programme, 2013). The Programme has also been incremental in the development of tools and approaches in pilot projects, which has been critical to the lessons learnt and progress made. Through the process of piloting, the Programme and its partners was able to innovate and adapt. Constraints and opportunities across multiple sectors were identified, barriers overcome through adaptive management with partners, capacity strengthened through learning by doing, and in some cases, influenced public and private sector policies.

Land in production landscapes have been formally secured for biodiversity management; the enabling environment for biodiversity conservation in production landscapes has been strengthened through the mainstreaming of biodiversity into national policy and planning and have catalysed the Umngeni Ecological Infrastructure Partnership (UEIP) (Grasslands Programme, 2013). This initiative was informed by lessons from Grasslands Programme's pilot projects in payments for ecosystem services; in the agricultural sector the programme has supported proclamations of protected areas, developed biodiversity agreements, published guidelines and provided strategic advice into agricultural laws and policies;

The programme has (Grasslands Programme, 2013):

- Delivered results at both the foundational level (tools, capacity, and partnerships) and at the impact level (hectares protected, better managed production landscapes, ecological infrastructure delivering valuable services to people).
- Ensured biodiversity management is not an 'add on' but is aligned with production practices.
- Managed risk through adaptive leadership, flexibility and innovation.
- Scaled up projects and shown replication of interventions in other areas.
- Shown the value of a focused strategy and a consultative and reflective process to plan for sustainability.
- Provided science-based policy advice that has catalysed systemic mainstreaming for improved investment in and security of biodiversity and ecological infrastructure.
- Shared lessons learnt with local, regional and international audiences

The grasslands Programme identified six key ingredients as common when biodiversity was successfully mainstreamed into production sectors. These were as follows (Grasslands Programme, 2013):

i. Provide science-based leadership and expertise,

ii. Deliver high quality tools,

iii. Make the case for biodiversity,

iv. Strengthen capacity to mainstream biodiversity,

v. Convene focused discussion platforms,

vi. Provide science-based policy advice.

These may be considered the important lessons learnt, which will aid future projects implementing similar tools and approaches for mainstreaming biodiversity.

Additional lessons learnt are as follows:

- **Pilot projects:** Through piloting projects the Programme was able to innovate and adapt. Constraints and opportunities across multiple sectors were identified, barriers overcome through adaptive management with partners, capacity strengthened through learning by doing, and in some cases, influenced public and private sector policies.
- **Innovative leadership:** A key behavioural change has been the approach of the Programme managers towards innovation and being able to work across many different sectors of society and government.

➢ **UMngeni Ecological Infrastructure Partnership (UEIP) (SANBI, 2015)**

The uMngeni Catchment, in KwaZulu-Natal, has deteriorating water quality and water availability (SANBI and Wildlands Conservation Trust, 2015). This has had a severe impact on surrounding municipalities in the region. Due to engineering solutions not being feasible or affordable, municipalities started searching for innovative, alternative solutions. An ecological infrastructure project was conceived by SANBI and the municipal leadership of eThekwini Metropolitan Municipality, specifically the DWS and the Department of Environmental Planning and Climate Protection. The project was considered appropriate in this area due to the public and private partners with associated interests in the health of the catchment. This has resulted in 21 partners signing a memorandum of understanding establishing the UMngeni Ecological Infrastructure Partnership (UEIP).

The UEIP has contributed to focussing attention on the importance of ecological infrastructure and the numerous benefits that can be achieved by investing in the maintenance and restoration of ecosystems (SANBI and Wildlands Conservation Trust, 2015). This will benefit downstream users, as well as the health and well-being of rural communities who depend directly on the streams and rivers.

Key lessons learnt are as follows:

- **Partnerships:** A crucial component of the UEIP is the fact that there is a range of government buy-in from the start. There are also a range of public and private organisations who are interested in the project.
- **Pilot projects / Demonstration projects:** Pilot projects such as the Palmiet River Rehabilitation, Save the Midmar Dam and Baynes Spruit Rehabilitation projects increase awareness of the UEIP. Significantly the showcase of the Baynes Spruit Rehabilitation project during the International Day for Biological Diversity on 22 May 2015 occasion was also used to launch the national DEA's Local Government Support Strategy, which recognises the important role that municipalities should be playing in the management of ecological infrastructure.
- **Education:** WESSA has been tasked with implementing a capacity development project for the UEIP. It involves putting together an informative document of all the workshops and courses offered by different relevant organisations to empower all the role players in the catchment to be better custodians of the ecological infrastructure.

- **Umzimvubu Catchment Conservation Programme (UCCP) (CSA/Environment & Rural Solutions, 2010)**

The Critical Ecosystems Partnership Fund (CEPF) is funding initiatives in the Umzimvubu Catchment that aim to address strategic environmental management challenges in this critically important Biodiversity Hotspot. The initiatives include the identification and implementation of a range of biodiversity conservation and sustainable land management interventions that address environmental priorities within the local socio-economic context (UCCP, 2011), Figure B-2. CSA's vision is that South Africa's Hotspots are restored and maintained to provide water, food and climate change resilience for the long-term benefit of people and nature. To achieve this, CSA is committed to a 20-year Umzimvubu catchment conservation programme. The project proposes the establishment of a catchment management strategy and restoration plan for the Umzimvubu River corridor, with implementation commencing with strong stakeholder collaboration and demonstration projects in the Upper Catchment, aimed at the expansion and implementation of principles and techniques to the wider catchment over the next two decades (UCCP, 2011).

CSA intends to test Conservation International's global hypothesis that healthy ecosystem services lead to human well-being (UCCP, 2011). The first phase will focus on establishing appropriate restoration and stewardship models on communal and private land, through six demonstration pilot projects. The pilots will develop the capacity of the sellers and the value of the land and maintenance services they will sell, through building stewardship capacity.

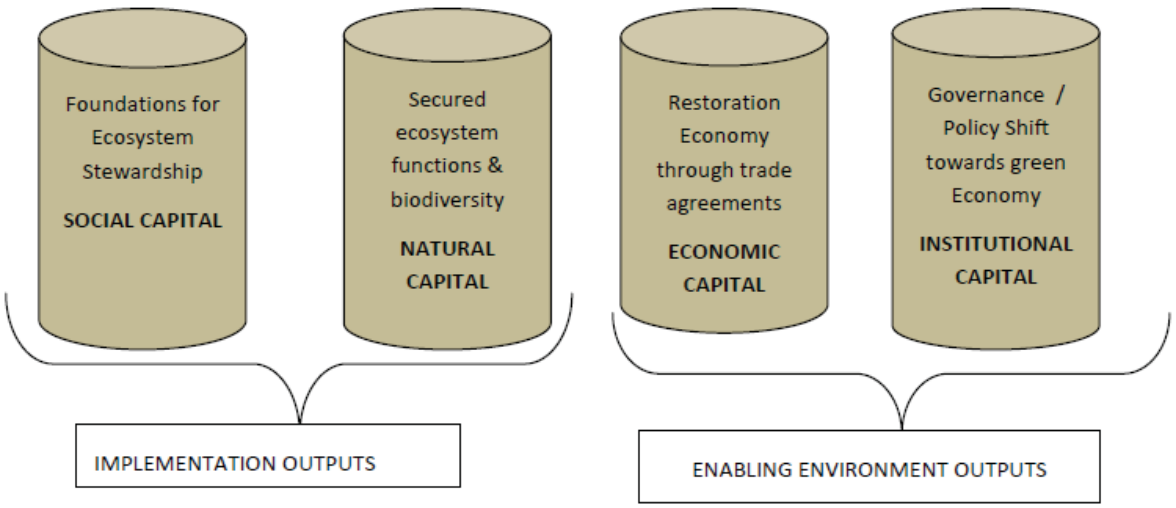

Figure B-2: The UCCP response strategy and desired outputs for the healthy ecosystem function of Umzimvubu catchment, providing services and benefitting local & downstream people (UCCP, 2011).

An Umzimvubu co-ordination unit is currently based in Matatiele, which is facilitating two key interventions within the first phase, that being:

- **Creating an enabling environment** through programme co-ordination, policy and co-ordination support for relevant catchment issues, co-ordinate research and monitoring of river status and veld composition, and supporting the implementation at demonstration sites, plus

- **An action learning approach** based on implementation of demonstration projects clustered across the upper catchment in five main nodes, which will include on-the-ground interventions to establish stewardship groups which can commence the restoration activities for securing improved ecosystem services, in response to the problems outlined above. These will include three land tenure types, i.e. communal, private and state protected.

Key lessons learnt are as follows:

- **Focus base:** Having a base to start operations is useful as it allows the UCCP to identify partners already working in the area and develop a clearer understanding of what is happening "on the ground".
- **Create an enabling environment:** Pilot projects are selected based on the presence of existing institutions willing to collaborate to achieve the catchment vision; presence of active local groups such as savings clubs, CWP groups and small enterprise-based CBOs; alignment with critical biodiversity areas; critical catchment areas under threat; alignment with restoration and services potential identified in the MDTP trading model outline (2007); and existing or upcoming funded activities.
- **Action learning approach:** Action learning will be achieved through the establishment of pilot projects. Pilot projects will include management of alien plant infestation; improving basal cover; extending and linking biodiversity stewardship areas on private land and promoting Green Choice and Biodiversity & Red Meat Initiative; brokering and securing PES agreements between the Matatiele Nature Reserve and water users in Matatiele town.

CLIMATE CHANGE ADAPTATION

The National Climate Change Response White Paper (2011) identifies the challenges that will be faced by the DEA in terms of managing natural resources under the pressures of a changing environment. Although currently there are many policy documents being written, case studies and pilot projects have been conducted to engage with communities most vulnerable to climate change.

- **Lesotho Climate Change Adaptation Project (LCCA) (INR, 2011)**

The Lesotho Highlands has been identified as a region most vulnerable to Climate Change. The inability of communities in the mountain zones of Lesotho to adapt in the face of the impacts of climate change not only threatens their own livelihoods, but also the production of water from the catchment, which sustains the LHWP, and which in turn affects the economy of Lesotho as well as South Africa (Lewis *et al.*, 2011). The Lesotho Climate Change Adaptation Project (LCCA) aims to build capacities of local communities, NGO networks and government departments through tackling the interrelated issues of poverty, environmental degradation and biodiversity loss.

The first phase of the project focused on understanding livelihoods and ecosystem functioning in the Lesotho Highlands order to identify potential risks and vulnerabilities associated with the predicted changes to the climate (Lewis *et al.*, 2011). This information was intended to be used to inform the identification of key adaptation strategies and interventions that could be undertaken by households to cope and adapt to the impact of climate change so as to maintain livelihood resilience and protect ecosystem functioning (Lewis *et al.*, 2011).

The first step involved determining the impacts of climate change on ecosystem function, this was done through linking function land cover classes with ecosystem services, scoring the ecosystem services and then interpreting the changes in land cover and ecosystem services for Climate Change scenarios. This was done for Agriculture and Livelihood impacts too. Key driving forces for projected change to Ecosystems and livelihoods include land transformation and climate change; for projected changes to Agriculture systems include reductions in crop production and decrease in carrying capacity of lands for livestock; and for Social systems households are already vulnerable to Climate Change due to high levels of poverty and a lack of capacity (Lewis *et al.*, 2011). Key recommendations included developing governance structures to better facilitate a willingness to change; diversify crops production, develop in-field and household water harvesting, crop rotation, soil conservation, control livestock stocking rates;

and increase capacity building and awareness, develop effective governance and livelihood diversification.

A key lesson learnt are as follows:

- **Understand Livelihoods and Ecosystem functioning:** Before solutions were proposed an in-depth study into the Climate Change impacts on Ecosystem functioning, Agriculture systems and Livelihoods was conducted. This allowed the project team insight for identification of key adaptation strategies and interventions to be used by households.

➢ **Skeppies: Building Resilience to Climate Change (CAP/CSA, 2010)**

The SKEPPIES small environmental enterprises and projects, in Namaqualand in the Northern Cape, generally have a minimal impact on the environment in terms of their carbon footprint and Green House Gases (GHG) emissions. They are all small-scale projects, with low water and low electricity demands. Some use donkey carts for transport while others rely on wild-collected fuel wood rather than electricity for cooking. Many of these projects will, however, feel disproportionately great impacts of climate change (Bourne and Terry, 2011).

The Climate Action Partnership (CAP) and Conservation South Africa (CSA) started monitoring local weather patterns with 11 selected Skeppies 'Building Resilience to Climate Change' projects in 2010 (Bourne and Terry, 2011). Daily climate diaries, developed by Indigo Development and Change and designed to facilitate climate monitoring by the project members themselves, were distributed to participants. The diaries were intended to raise awareness amongst project members about climate variability and change how these impact on their conservation and business endeavours. Participating projects were also given monitoring instruments (rain gauges and digital thermometers) and trained in the use of these and the completion of the diaries.

All the projects which have participated in the climate monitoring process to date gained much greater awareness of weather patterns and how much the climate actually did influence their businesses as well as their daily lives (Bourne and Terry, 2011). Regular opportunities to obtain feedback on their experiences with climate monitoring and to share lessons around their adaptation progress have been invaluable, leading directly to the identification of water as a key concern for most if not all of the project implementers. All the above interactions with the projects also highlighted that projects would benefit from business management support.

Key lessons learnt were as follows:

- **Climate knowledge:** All participants greatly enhanced their knowledge of climate variability and local weather patterns and applied a lot of thought to the ways in which these patterns affect their small environmental enterprises.
- **Awareness about water scarcity:** Monitoring the rainfall showed the project how little water actually falls when it only drizzles and raised greater awareness generally of the impact of the weather.
- **Preparedness for climate change:** Many added that the knowledge they had gained enhanced their ability to prepare for climate change. More financially sustainable and environmentally sound projects are more resilient to climate change.
- **Monitoring and adapting the process:** Monitoring of the climate diary process formed the basis for knowledge exchange through several site visits, phone calls and training. The face-face meeting with project implementers was highly valued by participants, and also provided an important opportunity to review successes and challenges. Early interactions alerted

implementers to the importance of water scarcity, and led to a workshop in Water and Climate Change.

- **Identifying key challenges and providing solutions:** Using the awareness raised by climate monitoring to identify water as a key priority area for action resulted in a focus on supplying water saving technologies such as rainwater collection and storage tanks for the *kookskerms* (cooking shields) and a wind break to prevent evaporation from the Port Nolloth Bird Park's indigenous garden.

➢ **Climate Smart Agriculture (ARC, 2015)**

The Food and Agriculture Organization (FAO, 2010) highlighted that agriculture in developing countries must undergo a substantial transformation in order to meet the related challenges of food security and climate change. The adoption of climate smart agriculture (CSA) as an adaptation strategy is intended to help smallholder farmers adapt to climate change by intensifying or diversifying their livelihood strategy (Nciizah *et al.,* 2015). Climate smart agriculture is agriculture that sustainably increases productivity, resilience, reduces/removes greenhouse gases, and enhances achievement of national food security and development goals (Nciizah *et al.,* 2015).

In South Africa smallholder and subsistence farmers are mainly concentrated in the former homeland areas of the country and are consequently marginalized into regions of poor productive land, with little or no infrastructural support and water resources. This has resulted in areas where farmers have low levels of production efficiency and a need to engage in agriculture production to supplement their household needs, with surplus being sold to local markets (Nciizah *et al.,* 2015). Inefficiencies are exacerbated due to the lack of farm management skills and poor service in terms of financial services, technical support, access to transport and other support infrastructure (DAFF, 2011). This has meant that poor farmers resort to poor agricultural practices, which have resulted in extreme losses of topsoil and the creation of large gullies (Nciizah *et al.,* 2015). CSA may be the most plausible solution for these farmers in order to maintain food security.

DRDLR in conjunction with the ARC-Institute for Soil, Climate and Water (ARC-ISCW) is implementing a project aimed at promoting conservation agriculture in several rural communities in the Eastern Cape and Kwa-Zulu Natal provinces.

Key lessons learnt are as follows:

- **Promote alternatives:** The ARC and DAFF are embracing alternative farming techniques such as CSA in order to provide adaptation and mitigation measures for Climate Change.
- **Understand the challenges with promoting alternatives:** CSA has been criticised for not being feasible due to the high transition costs associated with the following:
    - Farmers must first invest in learning about a greater diversity of practices and measures.
    - Farmers need to acquire information and management skills.
    - During the transition and learning period, farmers must experiment more, and incur the costs of making mistakes as well as of acquiring new knowledge and information.
    - New technologies often require more labour.

INTEGRATED MANAGEMENT

The main form of integrated management in South Africa has been Integrated Water Resource Management (IWRM). South Africa's highly-acclaimed National Water Act (NWA, Act 36 of 1998) provides the foundation for IWRM. The NWA seeks sustainability and equity, in a bid to move towards integration, redistribution and equity in allocation, sustainable use, resource protection and participation. IWRM itself aims to strike a balance between the use of resources for livelihoods and its protection for future generations, whilst promoting social equity, environmental sustainability and economic efficiency (Pollard and du Toit, 2008).

- **Inkomati-Usuthu Catchment Management Agency (ICUMA, 2004)**

An important part of IWRM in South Africa is that responsibility and authority need to be given to catchment management agencies (CMAs) which will have jurisdiction over the 19 water management areas. Development of these CMAs has been slow and challenging, with many still in various stages of development. Since the establishment of these CMAs was so challenging, the Department reviewed the appropriateness of having 19 CMAs across the country, and reduced the number of CMAs, to nine. As part of this process, the Inkomati water management area, which had a functioning CMA, and the Usuthu catchment from the Mhlatuze-Usuthu water management area, which had a CMA on paper but was not functional, were combined into one water management area, to be called the Inkomati-Usuthu water management area. The Inkomati-Usuthu CMA therefore manages the water resources in this water management area, and the non-functional Mhlatuze-Usuthu CMA was disestablished.

The Inkomati CMA has been established and is functional, with a Governing Board, CEO and staff in place. It has developed its first catchment management strategy which has been approved by the Minister. The Inkomati Basin, which is the area to be served by the Inkomati Catchment Management Agency, consists of three major catchments and two minor catchments. The major catchments are the Komati, Crocodile and Sabie-Sand catchments, and the minor catchments are the Nwaswitsontso and Nwanedzi catchments. The two minor river catchments fall within conservation areas within the Kruger National Park. Irrigation is the primary water consumer inside the basin. Catchment Steering Committees have been established for the Komati, Crocodile and Sabie-Sand Catchments.

Key lessons learnt are as follows:

- **Lengthy public participation:** As the first "pilot study" for CMA establishment, the IUCMA took 7 years of public participation before establishment. This is a lengthy process, in part due to the necessity of engaging with disadvantaged communities. Anderson (2005) identifies the following issues that emerged through engaging with disadvantaged communities during the formation of the IUCMA:
    - Legitimate representation
    - Raising public awareness
    - Creative and accessible communication
    - Accurate and reliable information
    - Implementing a common vision
    - Facilitation and conflict resolution skills
    - Building consensus
    - Power imbalances

- **Africa at a meso-scale: adaptive and integrated tools and strategies for natural resource management (Afromaison, 2014)**

The Afromaison project is concerned with developing adaptive and integrated tools and strategies for integrated natural resources management (INRM). INRM can be defined as:

"An approach that integrates research of different types of natural resources into stakeholder-driven processes of adaptive management and innovation to improve livelihoods, agro-ecosystems resilience, agriculture productivity and environmental services at community, eco-regional and global scales of intervention and impact" (Ochola *et al.*, 2010)

INRM encompasses the concept that natural resources are not only important for direct use, but are critical in supporting basic service provision, local economic development and social wellbeing. In so doing, it aims to contribute to integration of landscape functioning (regarding the delivery, use and access to goods and services provided); livelihood and socio-economic development (including vulnerability to global change); and institutional strengthening and improved interaction between sectors, scales and communities. The Afromaison project addresses INRM through three means: meso-scale management; participatory planning; and an ecosystem services (ES) approach to planning and management.

Three groups of tools were identified for achieving these means:

- Tools for spatial planning
- Approaches for restoration and adaptation of natural resources (NR)
- Economic tools and incentives

Key lessons learnt are as follows:

- **Tools:** Effective INRM requires proper planning and the use of tools and incentives in order to develop sustainable projects.

Review of existing South African Guidelines

COMMUNITY BASED GUIDELINES

- **Community Based Natural Resource Management Guidelines (CBNRM, 2003)**

The CBNRM guidelines were intended to help people understand the roles and responsibilities of everyone involved in CBNRM, especially those involved "on the ground". As a part of the development of the guidelines a review of policies as of 2003 was conducted to determine how CBMRM was catered for. Although it was noted that South African policies are concise and progressive, the actual implementation and development of guidelines for implementations had serious short comings. Several guidelines vary in the level of detail provided, and most follow a step wise "strategic" focus with little room for flexibility. None of the guidelines specifically mentions how to involve illiterate people in decision making and there is a weak understanding of the function and value of local and traditional knowledge. It was emphasised that CBNRM guidelines should focus on facilitating learning and adaptive management processes rather than on developing blue prints. The CBNRM guidelines focused on seven key principles necessary for a successful CBNRM programme, whereby each principle had a set of guidelines to help ensure that the principle is built into a programme.

A key lesson learnt is the following:

- **Shared understanding:** The CBNRM guidelines were developed to communicate what CBNRM is and make officials/NGOs/Implementing agents aware of how their programmes relate to CBNRM.
- **Range of users**: The CNRM guidelines were developed to be used by a range of stakeholders, from highly educated to illiterate. This is an important and relevant feature of guidelines intending to be used in communities.

LAND BASED GUIDELINES

As indicated above the LivingLands guidelines use a social concept to address a land-based challenge. This is indicative of the importance of integrating social theory into the development of guidelines, especially when being used “on the ground” such as in land-based projects. Other land-based guidelines are available through the WRC and ARC, which relate to specific farming techniques.

- **LivingLands Toolbox (LivingLands, 2013)**

The first part of the Living Lands Approach is the "U" methodology for leading profound change and is expanded and deepened in the Theory U, which was developed by the Presencing Institute at MIT (LivingLands, 2012). The second building block is the building of an evidence and knowledge base through transdisciplinary and action research. There is a strong focus on creating and building collective awareness and understanding of the socio-ecological needs, functioning, challenges, values, norms, and behaviours of individuals and organizations on the landscape. The last building block is the use of the Ecosystem Approach, a proactive strategy for integrated management of land, water and living resources that promotes equitable conservation and sustainable use as part of living landscapes. To be able to facilitate the above-described approach, Living Lands sees itself as a toolbox on the landscape and acts to fulfil its role as:

- **Landscape mobiliser**: Facilitating a social learning process to mobilise all stakeholders around the vision of living landscapes.
- **Knowledge broker:** Building (together with stakeholders, universities and other institutions) a solid knowledge base to inform restoration activities and sustainable development within the landscape.
- **Landscape ecologist:** Creating solid spatial understanding of the ecosystem and landscapes.
- **Network facilitator:** Engaging with the PRESENCE network to build private-public partnerships on the landscapes.

A key lesson learnt is the following:

- **External facilitation:** The need for external facilitation by experienced practitioners may be a strength and a limitation of the LivingLands toolbox. It is considered beneficial for engaging with communities via an “external” party, but this also limits the empowerment of the community being able to lead the process themselves.

BIODIVERSITY BASED GUIDELINES

The review of biodiversity-based guidelines starts with a broad overview of the planning tools used by the DEA, and others, for biodiversity conservation. These tools are integrative to further projects occurring both nationally and locally. The review of these tools was supplied by the Biodiversity for

Development primer document, which was published in 2010 and showcased the ideas and experiences of a range of individuals and organisations involved in biodiversity conservation in South Africa.

- **Products of systematic biodiversity planning**

Planning products includes maps displaying networks of critical biodiversity areas and ecological support areas, and land use guidelines linked to these areas. A nested system of biodiversity plans at different scales can be used to address specific planning and decision-making issues. Broad scale maps can be used to flag broad areas of importance for conservation action at the provincial or national level, whilst finer scale maps can be used to design protected area networks and inform land-use planning at the local level (Figure B-3).

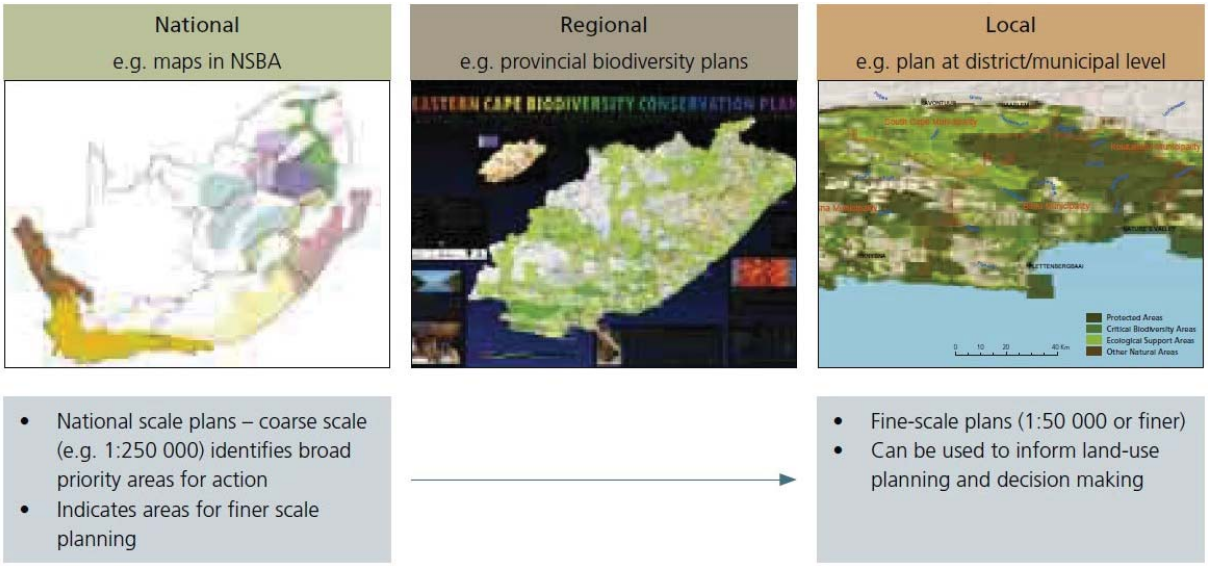

Figure B-3: Systematic biodiversity planning at different scales (Cadman, Petersen, Driver, & Sekhran, 2010).

- **Mainstreaming biodiversity**

South Africa's strategy for mainstreaming biodiversity in land-use planning at the local level has three elements, namely clear information; raised awareness and capacity; and embedding biodiversity priorities into institutions. A nested system of strategic development and spatial planning at national, provincial and local levels provides many opportunities to embed biodiversity considerations (Figure B-4). A case study of the Eastern Cape Biodiversity Plan indicates that a sector plan is not useful for operational decision-making at the site level as the spatial scale is too coarse.

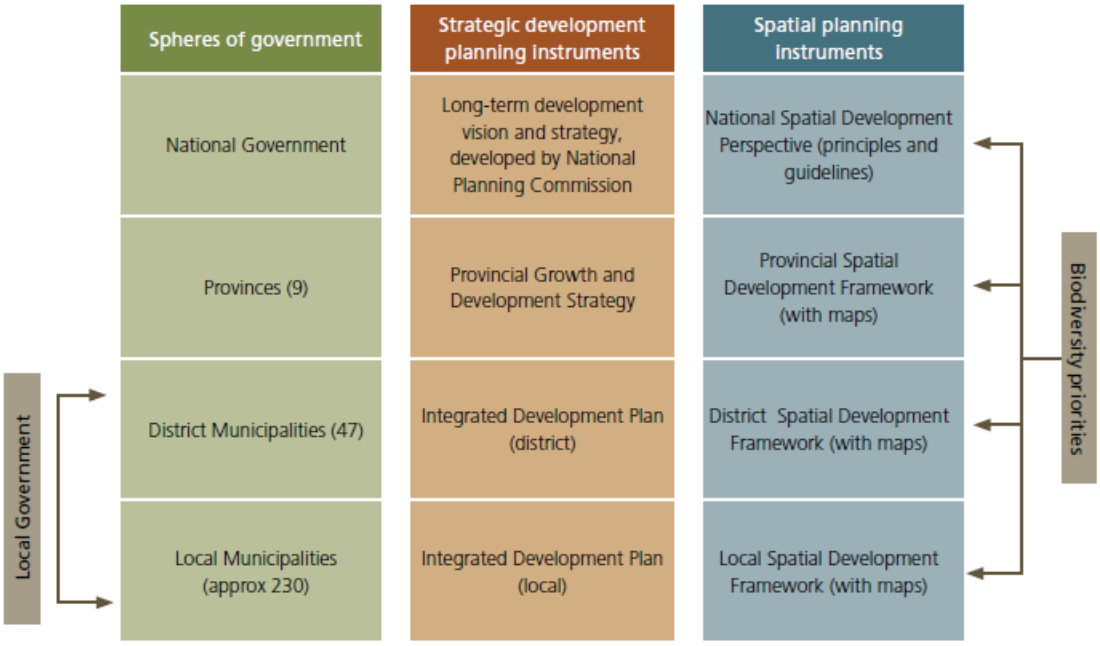

Figure B-4: Nested system of spatial planning influencing land-use planning and decision-making in South Africa.

- **Biodiversity Sector Plans**

Biodiversity sector plans can be used in a number of ways by land-use planners and decision makers. National plans are useful for securing political buy-in and for informing national or provincial policies, whilst finer scale plans can be used to inform operational decision making at the local level. The land-use guidelines in biodiversity sector plans provide general recommendations regarding types of activities that are permissible in broad areas of biodiversity importance as shown on the map.

In the Western Cape Province, a practitioners' manual has been developed to provide detailed ecosystem guidelines for use in environmental assessments (De Villiers *et al.*, 2005).

- **Availability of biodiversity information through the web**

To encourage the uptake of these state-of-the-art biodiversity plans this information needs to be available and useful to a wide range of end-users. SANBI has established a Biodiversity-Geographical Information System (BGIS) website (http://bgis.sanbi.org), which provides spatial data in the form of interactive maps and GIS data layers with a wide range of reports and supporting databases.

- **Expanding protected areas through stewardship**

It is imperative to expand protected areas in order to meet biodiversity targets and maintain ecological infrastructure of the country. Expansion of protected areas needs to be sensitive to the rights of landowners and communities. Biodiversity stewardship creates a mechanism for establishing and expanding protected areas and creating connectivity across landscapes, thereby securing ecological corridors through partnerships with private and communal landowners.

- **Working in production landscapes**

A "production landscape" refers to a landscape which is directed primarily towards economic activities that modify natural ecosystems to generate products for human consumption or use. These landscapes range from those where compatible land uses, such as grazing or livestock, take place in combination

with some form of conservation management, to those that are heavily modified for intensive production. As over 75% of terrestrial landscapes in South Africa are managed by farmers, the primary focus has been on the agricultural sector. The main concern being reduction of the negative environmental impacts of unsustainable production practices. Approaches are needed that:

- Recognise the land-use rights of landowners;
- Address the challenges faced by agriculture and other production sectors;
- Respond to broader environmental concerns as well as social and economic factors;
- Are applicable across entire sectors and value chains, and
- Can be implemented alongside other activities that influence land-use practices in production landscapes.

The bulk of South Africa's agricultural landscapes are used as rangeland for grazing cattle, sheep and goats for commercial uses, similarly so in communal areas. A land-use compatibility assessment conducted in the Grasslands Biome (O'Connor, 2005) indicated that rangelands are highly compatible with sustaining biodiversity, if managed correctly. Many local communities in South Africa are rely on the harvesting of wildflowers for their livelihoods. Two important guidelines are guidelines for the sustainable harvesting of wildflowers based on local knowledge combined with scientific research, and the generic guidelines for sustainable farming entitled "GreenChoice Living Farms Reference".

Regardless of the sector for which they have been developed, in South Africa the successful implementation of best practice tools depends on there being:

- **Demonstration activities** to test and adapt production systems to conserve biodiversity better, while maintaining economic viability
- **Strategic partnerships** with industry and industry associations to promote systemic adoption of better practice guidelines and protocols
- **Specialist support** to adapt existing production systems in order to strengthen biodiversity compatibility
- Ongoing, **integrated support** to industry role-players, across the value chain
- Appropriate **recognition and reward** for producers who adopt the guidelines
- Strong **market-related incentives** for producers who participate in best practice initiatives.

Meeting these criteria demands ongoing inputs of time and resources and requires the involvement of a wide range of professionals with specialised skill-sets. Other challenges include dealing with non-compliance effectively, particularly with regard to unauthorised clearing of land and water-use, and the development and implementation of effective monitoring systems.

Table B-2 Summary of the types of tools that have been developed in various production sectors (Cadman, Petersen, Driver, & Sekhran, 2010).

Sector	Types of tools currently available (2010)
Agriculture	Best practice guidelines
	Biodiversity stewardship agreements
	Agricultural extension to promote sustainable farming
	Eco-labelling
	Procurement advice and consumer awareness
	Proactive planning using maps or critical biodiversity areas
Wild-harvesting	Guidelines for sustainable harvesting
	Guidelines for training
	Guidelines for eco-labelling
	Guidelines for certification
Plantation forestry	Biodiversity stewardship
	Biodiversity planning tools
	Certification for small-grower forestry expansion
	Guidelines for small-grower forestry expansion
Fisheries	Procurement advice and training
	Consumer awareness campaigns
	Ecosystem approach to responsible fisheries
Mining	Biodiversity offsets
	Guidelines for rehabilitation
	Advisory forums
	Enforcement of compliance

- **Environmental public works programmes**

An important component of the green economy is restoring and conserving natural ecosystems through "green jobs". In South Africa terrestrial, freshwater and marine ecosystems are widely used for commercial and subsistence purposes. In terms of goods and services provided by natural systems the total value is about R73 billion (in 2009, refer to Table B3). This is a valuable commodity in terms of South Africa's Gross Domestic Product (GDP).

Table B-3 Value of ecosystem services in South Africa (Turpie et al., 2009).

	Ecosystem service	Value in R million/year
Goods	Grazing	18 094
	Natural resources	4 895
	Bioprospecting	178
Services	Carbon sequestration	8 649
	Pollination	5 684
	Erosion control	8 319
	Regulation of water flows	440
	Water treatment	202
	Blackfly control	77
	Crop pest control	4 380
	Nursery value of estuaries	976
Attributes	Ecotourism	2 100
	Scientific value	15
	Total value of selected ecosystem services	73 000

Since 1995, environmental public works programmes that maintain, rehabilitate or restore natural landscapes and ecosystems, have become an important job creator in the country. Following on from the first programme: Working for Water; several other environmental public works programmes have been developed.

CLIMATE CHANGE ADAPTATION-BASED GUIDELINES

Only recently have climate change adaptation guidelines been developed in South Africa. These guidelines focus on the individual experience and use a story telling framework.

- **Benefiting from the Environment in a Changing Climate (INR, 2011)**

As a product from the LCCP the INR developed a booklet to provide communities living in the Lesotho Highlands an insight into the benefits adaptations such as sustainable land management practises can have on the rangelands and their livelihoods in a changing climate. The booklet describes and illustrates the value of ecosystem services and details the practices of sustainable land management.

A key lesson learnt is as follows:

- **Illustrations:** The booklet is aimed at communities in the Lesotho Highlands, which may not have high levels of education. The use of illustrations and pictures as examples is an effective way of describing the impact of Climate Change and as a “how-to” guide for sustainable land management.

- **Participatory Adaptation Framework (Indigo Development and Change, 2014)**

The Participatory Adaptation Framework book was developed by a group of practitioners from South Africa, Ethiopia and Germany, drawing from their collective experiences in supporting local communities in adapting to increasing climate variability and change (Oettel *et al.*, 2014). The book is meant to meet the needs for practitioners to have a comprehensive tool to support practical adaptation interventions. The approach taken is based in Participatory Action Research (PAR), which recognises that the people affected by climate variability and change are not necessarily the ones responsible for implementing responses within their own enterprises and communities. Enabling these communities to become responsible for implementation via access to suitable technologies, accurate information, state of the art predications and supportive institutions, means that they are far more likely to do so in ways that are effective and appropriate. The PAR approach seeks to enable people to assess and respond to the risks that they themselves perceive. In this context communication of information relating to changing climatic patterns and their likely impacts is a crucial input into local level adaptation processes.

Key lessons learnt are as follows:

- **Enable people:** THE PAR approach enables communities to become responsible for implementation, this means that they are far more likely to do so in ways that are effective and appropriate.

- **ShareNet (WESSA, 2010)**

In 2010, WESSA, with support from USAID, launched the "Stepping Up to Sustainability" concept, incorporating the "Sustainability Commons". The “Step by Step: Stories of Change” are presented in booklet form, including a range of sustainability technologies that support more sustainable lifestyle choices. These include reducing, sorting and managing waste better, installing renewable technologies, conserving and teaching about water management, as well as, providing experiential courses on biodiversity. The goal is simply to encourage the public to put into practice the lifestyle choices required for adaptation to climate change. This involves the choices individuals and communities make in their day-to-day lives. The idea is for individuals to make the choice to “step up to sustainability" and seek to do something about minimizing their environmental footprint.

The project was disseminated through WESSA's ShareNet portfolio. These resources have been made available through WESSA for environmental education across South Africa. Resources that are available through ShareNet are as follows:

- **Sustainable Technologies:** People, Products and Practices. A handbook for deliberating climate change adaptation and ecosystem restoration.
- **Health Gardening**
- **Knowing and Growing Muthi Plants**
- **Household Environmental Management**
- **Eating for the Earth:** A selection of vegetarian recipes
- **Puzzling Climate Change:** A start-up pack of pictures
- **The Handprint Resource Books** – Action Towards Sustainability
    - Recycling, Waste Reduction and Creative Re-Use
    - Did you grow your Greens?
    - Re-using Shower and Bath Water
    - Growing Mother-tree seedlings

- **How to series**
    - How to make fire bricks
    - How to make a hotbox
    - How to build a traditional clay stove
    - How to build a pyramid vegetable garden
- **Change Choice Pamphlets** – with good, better and best lifestyle choices around energy, water, waste, shopping, travelling, gardening and more.

Key lessons learnt are as follows:

- **Existing resources:** WESSA has a range of existing resources in terms of “how-to” guidelines for household farming.

APPENDIX C: ENVIRONMENTAL LEGISLATION

ACRONYMS

BA	:	Basic Assessment
DEDEAT:		Department of Economic Development, Environment Affairs and Tourism
EA	:	Environmental Authorisation
EAP	:	Environmental Assessment Practitioner
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Management Plan
EMPr	:	Environmental Management Programme
GA	:	General Authorisation
GN	:	Government Notice
HWC	:	Heritage Western Cape
MMP	:	Maintenance Management Plan
NEMA	:	National Environmental Management Act, Act 107 of 1998
NEM:AQA:		National Environmental Management: Air Quality Act, Act 39 of 2004
NEM:BA:		National Environmental Management: Biodiversity Act, Act 10 of 2004
NEM:WA:		National Environmental Management: Waste Act, Act 59 of 2008
NHRA	:	National Heritage Resources Act, Act 25 of 1999
NWA	:	National Water Act, Act 36 of 1998
SAHRA	:	South Africa Heritage Resource Agency
R	:	Regulation

1. INTRODUCTION

One of the core purposes of this project is the protection of important land resources through rehabilitation and sustainable management practices. These rehabilitation and management practices are underpinned by environmental legislation that sets out to regulate activities involved as well as remote the sustainability of these practices. This is particularly important due to the scale of the proposed rehabilitation which pushes the project activities over several thresholds in terms of the environmental legislation, subsequently requiring authorisations and permits from several authorities to undertake these activities. This chapter sets out to briefly explain the mechanisms involved with the most pertinent environmental legislation, what processes are required and how to- best approach scenarios that would typically form part of this project. The project has also made a recommendation in terms of streamlining a reducing the onerous task for rural community-based rehabilitation projects.

The following environmental related legislation is of relevance to the project:

- Constitution of South Africa (Act No. 108 of 1996);
- National Environmental Management Act (Act 107 No. of 1998) as amended (including the National Environmental Management Amendment Act, (Act No. 62 of 2008) (NEMA); and the amended NEMA EIA Regulations (R982-985) (promulgated 4 December 2014) *and further amended 2017 (GN R324-327);*
- National Water Act (Act No. 36 of 1998);
- Conservation of Agricultural Resources Act (Act No. 43 of 1983);
- National Heritage Resources Act (Act No. 25 of 1999);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003);
- Mountain Catchment Areas Act (No 63 of 1970);
- National Environmental Management Waste Act (No. 59 of 2008);
- Mineral and Petroleum Resources Development Act (Act No. 28 of 2002).

The Constitution of the Republic of South Africa (Act No. 108 of 1996) includes far-reaching clauses relevant to the environment. In particular, the Bill of Rights stipulates that:

"Everyone has the right –

(a) to an environment that is not harmful to their health or well-being; and
(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -
    (i) prevent pollution and ecological degradation;
    (ii) promote conservation; and
    (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".

South Africa has rigorous and comprehensive environmental legislation aimed at preventing degradation of the environment, including severe erosion. Section 28(1) of the National Environmental Management Act (Act 107 No. of 1998) (NEMA) places a "duty of care and remediation of environmental damage" on every person who causes, has caused, or may cause, significant environmental degradation. This is a far-reaching obligation, and accordingly, those parties responsible for the degradation of the environment have a legal duty to avoid, minimise or mitigate such impacts. Due to the cumulative scale at which the rehabilitative measures are proposed, it is given that the proposed protection measures will trigger various components of South Africa's environmental legislation.

In order to address these issues of erosion, both hard and soft interventions should be implemented in the system, and it is the activities associated with the construction of these interventions that triggers requirements for various authorisations, licenses or permits. However, it is important to note that the very objective of this project is to improve both environmental and social circumstances.

2. THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT NO. 107 OF 1998), AS AMENDED (NEMA)

The National Environmental Management Act (Act 107 of 1998) states in its preamble:

"Whereas many inhabitants of South Africa live in an environment that is harmful to their health and wellbeing; everyone has the right to an environment that is not harmful to his or her health or wellbeing; the State must respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities; inequality in the distribution of wealth and resources, and the resultant poverty, are among the important causes as well as the results of environmental harmful practices; sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of decisions to ensure that development serves present and future generations; everyone has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that – prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development; the environment is a functional area of concurrent national and provincial legislative competence, and all spheres of government and all organs of state must cooperate with, consult and support one another…"

In terms of the 2014 Environmental Impact Assessment (EIA) regulations (*as amended*) pursuant to NEMA (GN R326), certain activities that may have a detrimental impact on the environment (termed Listed Activities) require an Environmental Authorisation (EA) from the competent authority[18].The implementation of interventions could trigger NEMA Listing Notices 1 (GN R327), 2 (GN R325) and 3 (GN R324).

[18] Section 6 of Regulation R326 of NEMA indicates that if the Minister is the competent authority in respect of a specific application, the application must be submitted to the national Department of Environmental Affairs (DEA). If a MEC is the competent authority in respect of a particular application, the application must be submitted to the provincial department responsible for environmental affairs in that province, in this case the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT).

Specifically, the following activities (detailed further in Table C-1):

- Listing Notice 1, GN R327: 12, 19, 27, and 48
- Listing Notice 2, GN R325: 24
- Listing Notice 3, GN R324: 12, 14, and 23

Should the proposed interventions trigger activities listed in Listing Notice 1 or 3, a Basic Assessment (BA) process[19] will be required to meet the necessary requirements of the Regulations, through the application for an Environmental Authorisation (EA). The BA process have two main deliverables a BA Report and an Environmental Management Programme (EMPr). The process and timeframes for undertaking a BA is shown in Figure C-1: Basic Assessment process and timeframes in terms of NEMA 2014 (as amended)

It is highly unlikely that a Listing 2 activity will be triggered, but in the event that it does a full Scoping and Environmental Impact Assessment (EIA) will be required. Furthermore, it is important to note that certain exclusion principles apply to those activities listed above in bold. Should the activities be triggered for maintenance purposes, then a maintenance management plan (MMP) can be compiled and submitted for approval to the DEDEAT. In this case, a full BA process is not required, and neither are its associated costs. This would require consultation with DEDEAT to ensure they are familiar with the process and legislation which have been undertaken in other Provinces.

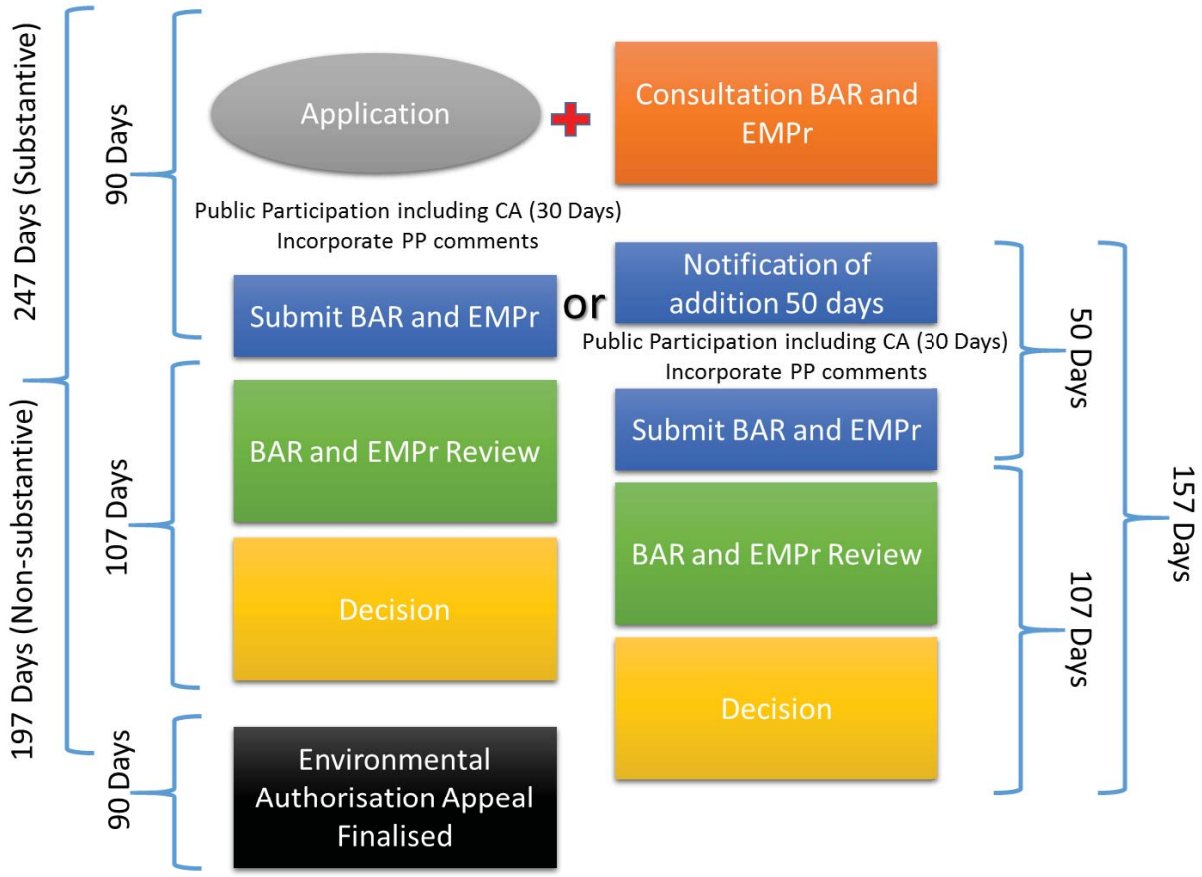

Figure C-1: Basic Assessment process and timeframes in terms of NEMA 2014 (as amended)

Further to the main Act and associated Regulations, a range of subsidiary Acts have been promulgated under the NEMA, which may have a bearing on the civil engineering projects (especially relating to large scale rehabilitation works). These Acts, hereunder, include:

[19] A Basic Assessment is an assessment designed for smaller scale activities where the impacts are generally known and can easily be managed, whilst a Scoping and EIA is a more comprehensive assessment designed for larger or more complex projects.

- The National Environmental Management: Waste Act (No. 59 of 2008), (NEM:WA);
- The National Environmental Management: Protected Areas Act (No. 57 of 2003) (NEM:PAA);
- The National Environmental Management: Air Quality Act (No. 39 of 2004), (NEM:AQA); and
- The National Environmental Management: Biodiversity Act (No 10 of 2004), (NEM:BA);

It is not foreseen that permits / license will necessarily be required in terms of these acts, but cognisance should be taken of requirements set out in them to ensure compliance with the requirements set out. In this regard, NEM:WA provides for national norms and standards for regulating waste management in all spheres of government and provides for the licensing and control of waste management activities. Waste is always generated during civil works and waste products should be dealt with in terms of this act. Furthermore, waste material i.e. building rubble is often resorted to as fill material without cognisance been taken of the legislative requirements regarding the deposition of waste to land.

NEM:AQA provides for, amongst others, the control of dust, noise and air pollution. The Act therefore aims to prevent pollution and ecological degradation via regulating air quality, to reform current air quality legislation and to provide national standards regulating the monitoring, management and control of air quality, while at the same time promoting justifiable economic and social development. NEM:AQA in terms of this project will mostly relate to the generation of dust during civil works. With regards to the control of dust, Section 32 (Control of Dust) of NEM:AQA refers to measures that may be prescribed to control dust in specified places or areas, as well as steps that must be taken to prevent nuisance by dust, and measures aimed at controlling dust.
The Department of Environmental Affairs draft model air quality management bylaw (GN 964 of 2009) states in Section 10 that any person conducting activities which customarily produce emission of dust that may be harmful to public health, well-being and/or cause a nuisance shall take control measures to prevent emissions into the atmosphere. Section 10(3) states that "any person who undertakes any activity that causes dust emissions must implement one or more of the following control measures:

i) pave;
ii) use dust palliatives or dust suppressants,
iii) uniformly apply and maintain any surface gravel;
iv) erect physical barriers and signs to prohibit access to the disturbed areas;
v) use ground covers;
vi) re-vegetation which is similar to adjacent undisturbed native conditions; or
vii) any alternative control measure approved in writing by the air quality officer."

NEM:BA provides for the management and conservation of South Africa's biodiversity via the protection of species and ecosystems (particularly those threatened) as well as promoting the sustainable use of indigenous natural resources via equitable sharing of such resources in a sustainable manner. Chapter 3 of the Act stipulates that a national biodiversity framework, a bioregional plan and a biodiversity management plan are required and that monitoring mechanisms and set indicators need to be designated in order to determine the conservation status of various components of South Africa's biodiversity; and any negative and positive trends affecting the conservation status of the various components. The national biodiversity framework, bioregional plan and any biodiversity environmental implementation or environmental management plans prepared in terms of this Chapter 3 of this Act may not be in conflict with any environmental implementation or environmental management plans prepared in terms of Chapter 3 of the NEMA.

In terms of Chapter 5 of NEM:BA all organs of state in all spheres of government must prepare an invasive species monitoring, control and eradication plan for land under their control, as part of their environmental plans in accordance with section 11 of the NEMA. The invasive species monitoring, control and eradication plan of municipalities must be part of their Integrated Development Plans. This is of key importance because part of the project works would be to undertake clearing of invasive alien plant species. In terms of Section 10 of NEM:BA, the South African National Biodiversity Institute

(SANBI) is the competent authority who oversees the implementation of this legislation. However, in terms of Section 36, in the event of absence of a functional Board, the powers and duties of the Board revert to the Minister who, in such a case, must exercise those powers and perform those duties until the board is functional again. In order to trigger any requirements under the NEM:BA, Activity 27 of Regulation R982 under NEMA will be triggered, thus requiring a Basic Assessment process to be undertaken. If a Basic Assessment process is required, the competent authority overseeing the NEM:BA will be the DEDEAT.

In order to undertake these legal requirements, the environment needs to be assessed by an independent Environmental Assessment Practitioner (EAP) with suitable skills and experience, as well as relevant specialists which most likely include freshwater ecologist, botanist and heritage (archaeology or palaeontology). Both the Basic Assessment and full Scoping and EIA processes require a considerable financial input (hundreds of thousands of Rands) and are subject to timeframes which are often in excess of a year to undertake. Local communities invariably do not have access to sufficient funds to undertake these studies. Incidentally the legal requirements are therefore hindering the ability for the land to be appropriately rehabilitated. Furthermore, contravention of the stipulations in the NEMA and its subsidiaries could lead to severe fines. In terms of Section 102 of NEM:BA, failure to comply with the requirements of the NEM:BA would constitute an offence, and the person will be liable to a fine not exceeding R5 million or to imprisonment for a period not exceeding 5 years. In the case of a second of subsequent conviction, the guilt person will be liable to a fine not exceeding R10 million or to imprisonment for a period not exceeding 10 years.

3. NATIONAL WATER ACT (ACT NO. 36 OF 1998) (NWA)

The National Water Act (Act No. 36 of 1998) (NWA) recognises that water is a scarce and unevenly distributed national resource and deals with water resource management and the sustainable use of water for the benefit of all users. The Act provides for the integrated management of all aspects of water resources and the delegation of management functions to a regional or catchment level so as to enable everyone to participate. The guiding principles of the NWA recognise the need to protect water resources. Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. These guiding principles recognise the basic human needs of present and future generations, the need to protect water resources, the need to share some water resources with other countries, the need to promote social and economic development through the use of water and the need to establish suitable institutions in order to achieve the purpose of the Act. In terms of this Act, the responsibility for water quality and control of water pollution falls under the national government, but water services authorities have a role in the control of industrial water pollution.

In general, a water use must be licensed unless it is listed in Schedule I of the National Water Act, is an existing lawful use, is permissible under a General Authorisation (GA), or if a responsible authority waives the need for a licence. Chapter 4 of the Act lays the basis for regulating water use. The various types of licensed and unlicensed entitlements to use water are dealt with in detail in this Chapter.

In terms of the Act “Water use” includes:

- taking water from a water resource;
- storing water;
- impeding or diverting the flow of water in a watercourse;
- engaging in a stream flow reduction activity;
- discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- disposing of waste in a manner which may detrimentally impact on a water resource;
- disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

- altering the bed, banks, course or characteristics of a watercourse;
- removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- using water for recreational purposes.

Many of these water uses can occur during infrastructure work and must be licensed unless they comply with the requirements in terms of a General Authorisation.

Based on the information requirements and administrative process involved with the issuing of a license, the process typically takes approximately 18 to 24 months. Subsequently, cognisance must be taken of the time frames associated with such a process, and ensuing implications for projects and associated funding. There are several implications in the event of licence conditions being contravened. These range from the responsible authority requiring the licensee to take remedial action, failing which it may take the necessary action and recover reasonable costs from that person, to the suspension or withdrawal of a licence.

4. THE NATIONAL HERITAGE RESOURCES ACT (NO. ACT 25 OF 1999) (NHRA)

The Act distinguishes between Grade 1 (of national significance), Grade 2 (of provincial/ regional significance) and Grade 3 (other) heritage resources[20]. Grade 1 heritage resources are administered by the National South African Heritage Resources Agency (SAHRA), whereas Grade 2 and 3 heritage resources will be dealt with by Heritage Western Cape (HWC).

According to Section 27 of the NHRA, "no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site." Furthermore, according to Section 34 of the NHRA, "No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority". This is particularly important if there are historical structures in the watercourses affected that requires removal.

Section 38 of the NHRA states that any person who intends to undertake a development categorised as:
"(1) (a) the construction of a road … or other similar form of linear development or barrier exceeding 300 m in length;
(b) any development or other activity which will change the character of a site:
(i) exceeding 5 000 m² in extent; or
(ii) involving three or more existing even or subdivisions thereof; or
(iii) involving three or more even or divisions thereof which have been consolidated within the past five years; or
(c) the re-zoning of a site exceeding 10 000 m² in extent,

…must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development." To assist in this regard, the South African Heritage Resources Agency (SAHRA) have developed a form, "Notification of Intent to Develop," to be completed for any activity that meets one or more of the above criteria. The responsible heritage resources authority must, within 14 days of receipt of a notification, notify the person who intends to undertake the development whether an impact assessment report is required. If considered necessary, an impact assessment report must be compiled at the cost of the person proposing the development, by a person approved by the responsible heritage

[20] Heritage resources are defined as places, buildings, structures and equipment, oral traditions, historical settlements, geological sites and landscapes of cultural significance, archaeological and paleontological sites; graves and burial grounds, meteorites and rare geological specimens; ethnographic art and objects; military objects; books, records etc.

resources authority[21]. Should a permit be required for the damaging or removal of specific heritage resources, an application will be submitted to ECPHRA for the approval of such an activity. According to the 2014 EIA Regulations pursuant to NEMA, this can take place alongside the BA process under the "One Environmental Process."

5. KEY ISSUES

It is important to consider that the proposed project is not a development proposal and the project activities that requires an EA, licenses and permits in terms of Regulations pursuant to NEMA are only being undertaken to benefit the environment. Nevertheless, these processes are not only aimed at preventing negative environmental impact through development, but also to enhance the positive impacts and ensure the long-term sustainability of activities such as rehabilitation projects. The issue however comes in with the financial cost of compliance with legislative requirements as well as the time and often bureaucratic impediments that face projects of this nature.

This problem is not unique, and other large-scale projects have faced similar challenges. The Working for Wetlands Programme is a national programme managed by the Natural Resource Management Directorate of the Department of Environmental Affairs. Each year, several projects are chosen within a province and a planning process is undertaken, meeting the necessary legal requirements. However, the planning of this project is all undertaken by the South African Government, and the funding is sourced through tax payers' money. As some of the abovementioned activities are also triggered by the Working for Wetlands Programme, Maintenance Management Plans (MMPs) are created for each site in the form of project specific Rehabilitation Plans.

On the other side of the scale, a Water Research Commission (WRC) study have produced a set of guidelines for River Rehabilitation. The focus on these rehabilitative efforts are supposed to be used at a site-specific scale, to assist landowners in rehabilitating their wetlands. It is not intended for greater scale or to compete with the Working for Wetlands Programme. The guidelines provide general information about water resources in South Africa and include specific rehabilitation intervention suggestions, and how they can be implemented by the landowner. However, the legislation currently hinders these small interventions as they all require a BA process.

Furthermore, recently (GN R598 of 1 August 2014), an amendment to the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) promulgated the decision to require Invasive Species Monitoring, Control and Eradication Plans for listed invasive species as contemplated in Section 76 of the Act. These Plans will be required for each municipality and each Organ of State. If a landowner holds invasive species on their land, they are either required by law, to clear the invasive, or to compile a Control Plan and submit it to the municipality. Should a private landowner require funding to assist in the clearing of invasive species, by submitting a Control Plan, they are able to apply for state funding assistance.

However, households in the rural areas do not have the finances to compile and submit these expensive and administratively burdensome processes.
The above-mentioned examples are important considerations for acts of land rehabilitation and restoration projects that are currently underway in South Africa. They each provide the argument that rehabilitation efforts are hindered by the environmental legislation, however are finding alternative ways that the environment is assessed and the interventions are planned appropriately. It is recommended that through consultation with the relevant authorities and key stakeholders, that a plan such as one of the above be proposed for strategic land management in rural areas of the Eastern Cape.

[21] The competent authority to issue a Record of Decision to undertake an activity that triggers the requirements under the NHRA would depend on the nature of the activity. Should the activity involve a Grade 1 Heritage site, then the SAHRA would be the competent authority. All remaining requirements under the NHRA would be overseen by the provincial authorities, namely, HWC

Remediation and rehabilitation measures might require substantive amounts of material to be used for infilling and deposition in i.e. erosion gullies. Due to the rural nature of the project area it's possible that material will not be obtained from a commercial source or that the cost implication thereof would be excessive and therefore material would have to be borrowed locally. This would mean an application to extract material will have to be lodged at the Department of Mineral Resources (DMR) and a Basic Assessment will have to be undertaken to obtain an EA for this specific activity. Yet another financial burdening activity that may have to be funded by the local community.

5.1 DEMONSTRATED CHALLENGE

This can be illustrated with a practical example within the Ntabelanga Catchment.

Much like its neighbouring villages Sinxaku, in the Eastern Cape, is located on dispersive soils, i.e. highly erodible. The area is formerly homeland area and was extensively cultivated, but subsequent to 1994 there has been extensive rural-urban migration and only small areas of cultivation remain, mainly at homestead level, and there is still livestock grazing in the area.

Prior to 1994 there was extensive land care support through various agricultural extension initiatives, but as the cultivation has waned so too has the extension services. Where soil erosion started on previously cultivated land, that has since been abandoned without managing or mitigating the erosion, has now resulted in extensive donga and gullying across the landscape. The resultant land degradation and soil erosion has resulted in detrimental impacts at a Provincial scale, as illustrated in the images in Figure C-2.

Figure C-2: Images of extent of soil erosion in Sinxaku

This erosion is not only the loss of land and fertile top soil, but also contributes excessive volumes of sediment into the local watercourse reducing its quality for use. The erosion has extended for several kilometres and now threatens not only houses and household crops but also infrastructure such as roads and pipelines, but also cultural points such as the local cemetery.

The gully erosion is so deep it poses a safety risk not only to livestock but also to people including children.

The extent of this erosion requires very intensive mitigation to prevent further loss of land and infrastructure and to rehabilitate the damage to the natural capital and ecological infrastructure.

Simple and small-scale mitigation works e.g. vegetation barriers, and stone check dams, are insufficient or not effective enough in this case. Large-scale engineering works e.g. gabion structure will be far too costly over such a wide area, however the local community are still at risk and suffering from the ongoing erosion.

One form of mitigation could be to re-shape the gullies using cut-and-fill techniques to lessen the slope of the gullies which could then be revegetated, together with bunds to stabilize the head-cut erosion.

For one gully finger, this requires removing or infilling more than 10 m^3 of soil to or from the gully as the banks are shaped to a gentler gradient, and building several stone check dams.

However, in terms of the National legislation requirements, this one section of erosion rehabilitation to prevent damage to houses and infrastructure, requires ALL of the following National Legislation authorisations *inter alia*:

Legislation	Description	Applicable sections
National Environmental Management Act, Act 107 of 1998 (*as amended)* NEMA	• Development of structures with a physical footprint of 100 m^2 or more. • Removing or infilling of 10 m^3 or more of soil, stones, etc. • Clearance of 1 ha or more, but less than 20 ha, of indigenous vegetation	GNR 327 sections 12, 19, 27
National Environmental Management: Protected Areas Act, Act 57 of 2003 (*as amended)* NEM: PAA	As the area falls within a former Mountain Catchment Area (Act 63 of 1970) or its 5 km buffer, it requires permission in terms of the Protected Areas Act	Section 9, Section 16, Especially Section 17(L), Section 28

Legislation	Description	Applicable sections
National Environmental Management: Biodiversity Act, Act 10 of 2004 (*as amended*) NEM:BA	If a threatened butterfly species or grass species is found in the general area, authorisation in terms of Biodiversity Act is required.	Section 40 and 45; Section 52, 53, 57, 87.
National Water Act, Act 36 of 1998 NWA	As the gully is so deep it has cut into the water table and there is now regular flow of groundwater in gully channel, this requires a water use licence in terms of altering the bed, banks, course or characteristics of a watercourse	Section 1 Definitions especially 1(xxiv)(b); Section 21 Water Use especially 21(c) and (i); Sections 23,24,25,26,27,28,29,40, 41, 42
National Heritage Resources Act, Act 25 of 1999 NHRA	• As the length of the gully finger is more than 300 m, a permit in terms of the Heritage Resources Act is required. • The depth of the gully has exposed the shell midden, a permit in terms of the Heritage Resources Act is required. • Furthermore, as the cemetery is being eroded and mitigation work needs take place in this area it affects burial grounds and graves. • The local foot bridge to cross the stream is more than 60years old and will be disturbed during the reshaping process, this requires a permit in terms of the Heritage resources Act.	Section 1 Definition especially 1(viii), 1(xxxi), 1(xxxii); Section 34 Structures; Section 35 Archaeology, Palaeontology, Meteorites Section 35 Burial grounds and graves; Section 38 Heritage resources management.
	The soil that is removed in the process of re-shaping the gully, if it is not all used in the filling and re-shaping process. The soil could be:	
Mineral and Petroleum Resources Development Act, Act 28 of 2002 MPRDA	1. Sold to recoup some costs of the work, this requires a mining permit in terms of the mineral resources Act. The permit process includes an EIA.	Section 1, “Mineral”; Section 5(4).
National Environmental Management: Waste Act, Act 59 of 2008 NEM:WA	2. If it is dumped on adjacent land, it will require a waste management permit for the disposal of the soil	Section 1 “waste”; Section 20
Conservation of Agricultural Resources Act, Act 43 of 1983 CARA; and Government Notice R1048 in Government Gazette 9238, dated 25 May 1984. Commencement date: 1 June 1984.	Protection of cultivated land against erosion through the action of water.	Section 6; Section 12; GN Regulations 1048, especially section 4.

There may still be provincial and local government authorisations required.

Each of the above authorisations has its own requirements, detailed specialist studies, consultant requirements, public participation requirements, advertising requirements, application timeframes, etc.

As South Africa faces major water shortages, electricity shortages, and heading towards food shortages, the country cannot afford to lose productive land and water resources that should have and can be easily mitigated and rehabilitated. In order to uplift this area, there needs to be investment in water infrastructure i.e. water storage, hydropower and irrigation, but with the high sediment load none of these are feasible until the erosion is addressed.

6. WAY FORWARD

In order for the project to comply with the relevant environmental legislation (listed in Table C-1), to lessen the financial burden associated with compliance and to ensure that the project proponent does not fall liable to non-compliance fines and / or prosecution certain strategic measures can be put in place to streamline activities. For example, a Municipality or Provincial Government could compile a Catchment Management Plan, which identifies all the types of rehabilitation and land management activities that are required within the catchment area, the plan is approved by the various stakeholders e.g. DEDEAT, DWS, AND DRDLR – similar to a Spatial Development Framework. The various departments can then include these activities within their business plans, and local communities can implement small scale rehabilitation projects themselves without going through the necessary burdensome and expensively authorising processes.

Maintenance and Management Plans (MMP) in terms of NEMA

The aim of the MMP is to acquire authorization for the following Listed Activities, considered permissible provided that they are undertaken in accordance with the MMP once approved by DEDEAT:

1. LN 1 (19): The infilling or depositing of any material of more than 10 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.
2. LN 1 (27): The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation.
3. LN 2 (24): The Extraction or removal of peat or peat soils.
4. LN 3 (12): The clearance of an area of 300 square metres or more of indigenous vegetation in the Eastern Cape.

An MMP can be undertaken for a specific geographical area (e.g. watercourse, drainage area and / or municipality) and thus all the activities listed above can be applied for in terms of one MMP.

Basic Assessment Reports (BAR) in terms of NEMA

For those activities where, other Listed Activities would be triggered, and where an exemption option of an MMP is not provided, a Basic Assessment Process would be required. Typically, such processes are required per structure. It is however possible that the submission of one Basic Assessment Report per geographical area (village, municipality), which would allow for the assessment of all listed activities that could potentially be triggered whilst undertaking rehabilitation work (i.e. a blanket approval would be obtained for all listed activities related to developments and expansion). This would require the consultation and buy-in from DEADEAT and other authorities such as DWS and DAFF to ensure that certain aspects of the project does not delay the whole application.

General Authorisations (GA) in terms of NWA

In terms of Section 39 (GN 1199 of 18 December 2009) of the NWA, a GA has been granted for certain activities that are listed under the NWA that usually require a Water Use Licence. Such a GA exists for activities that entail (c) ‘impeding or diverting the flow of water in a watercourse’ and/or (i) ‘altering the bed, banks, course or characteristics of a watercourse’ or undertaking the above-mentioned water uses for the rehabilitation of a wetland’. In order to register these interventions, consultation with the Eastern Cape regional Department of Water and Sanitation (DWS) will be required.

Emergency situations

It's important to note that there is specific legislation in both NEMA and the NWA that address emergency situations. Certain rehabilitation measure might fall within the parameters of what constitutes an emergency situation and therefor rehabilitation measures can be put in places to remediate measures without going through timeous legislative processes. It's very important to note that legislation is time sensitive and if remedial efforts are not undertaken within reasonable time of the event which caused the situation e.g. flooding, it is exceedingly difficult to motivate to the competent authority why this constitutes and emergency situation.

Section 30 of NEMA has recently been amended in terms of the National Environmental Management Laws Second Amendment Act 30 of 2013 by the insertion of section 30A. Section 30A makes specific provision for dealing with emergency situations. An "emergency situation" is defined as:

"a situation that has arisen suddenly that poses an imminent and serious threat to the environment, human life or property, including 'disaster' as defined in section 1 of the Disaster Management Act, 2002 (Act No. 57 of 2002)"

Section 30A came into effect on 18 December 2014. Section 30A (1) allows for verbal and written directives to be issued by a competent authority to the person responsible to undertake listed or specified activities without obtaining the prerequisite environmental authorisation in order to prevent or contain an emergency situation or to prevent, contain or mitigate the effects of an emergency situation. General Notice 1081 of 2014 introduced "Regulations relating to the procedures to be followed when oral requests are made in terms of Section 30 A. Specifically, General Notice 1081 of 2014 states that an Application in terms of section 30A of NEMA is permissible when:

3. (1) Any person who reasonably foresees that:

(a) he or she may commence with a listed or specified activity identified in terms of Regulations promulgated under Section 24(2) of National Environment Management Act, 1998 (Act No. 107 of 1998) without an environmental authorisation; and

(b) commencement with such listed or specified activity would be directly in response to a situation that has arisen suddenly and which poses an imminent and serious threat to the environment, human life or property; or

(c) commencement with such listed or specified activity would be directly in response to a 'disaster' as defined in section 1 of the Disaster Management Act, 2002 (Act No. 57 of 2002),

The definition of what constitutes a disaster in terms of the Disaster Management Act is therefore important. A disaster is defined as "a progressive or sudden, widespread or localised, natural or human-caused occurrence which –

(a) Causes or threatens to cause

(i) Death, injury or disease;

(ii) Damage to property, infrastructure or the environment; or

(iii) Disruption of the life of a community; and

(b) Is of a magnitude that exceeds the ability of those affected by the disaster to cope with its effects using only their own resources"[22]

Thus, where an environmental emergency situation arises, the competent authority may dispense with the requirements for obtaining environmental authorisation where a listed activity is triggered for purposes of undertaking reasonable measures to prevent or contain an emergency situation or to prevent, contain or mitigate the effects of an emergency situation. [23]

In cases of extreme urgency involving the safety of humans or property or the protection of a water resource or the environment, section 67(1) of the National Water Act No 36 of 1998, allows for dispensing with certain requirements of Act:

[22]http://www.greenafricadirectory.org/wp-content/uploads/2014/07/IMBEWU_Section-30-of-NEMA-and-amendment-thereto_Sept-2014.pdf

[23] http://iaiasa.co.za/wp-content/uploads/2012/06/26.11.14-38253_gen1081-S30A-Regs-Draft.pdf

(1) In an emergency situation, or in cases of extreme urgency involving the safety of humans or property or the protection of a water resource or the environment, the Minister may
    (a) dispense with the requirements of this Act relating to prior publication or to obtaining and considering public comment before any instrument contemplated in section 158 (1) is made or issued;
    (b) dispense with notice periods or time limits required by or under this Act;
    (c) authorise a water management institution to dispense with -
        (i) the requirements of this Act relating to prior publication or to obtaining and considering public comment before any instrument is made or issued; and
        (ii) notice periods or time limits required by or under this Act.
(2) Anything done under subsection (1) –
    (a) must be withdrawn or repealed within a maximum period of two years after the emergency situation or the urgency ceases to exist; and
    (b) must be mentioned in the Minister's annual report to Parliament.

Table C-1: Summary of listed activities requiring authorisation for example rehabilitation of an erosion gully

Activity	Listed Trigger	Project Relevance
Listing Notice 1, GN R327		
GN R327: Activity 12	The development of – (i) Dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 m^2; or (ii) Infrastructure or structures with a physical footprint o 100 m^2 or more; Where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse;	The proposed rehabilitation interventions include interventions such as stone check dams, gabions, etc. which may exceed 100 m^2 either individually or cumulatively within the system. Furthermore, these will be constructed within the gully channel, which is considered a watercourse.
GN R327: Activity 19	The infilling or depositing of any material of more than 10 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m^3 from a watercourse; But excluding where such infilling, depositing, dredging, excavation, removal or moving – (b) is for maintenance purposes undertaken in accordance with a maintenance management plan;	Beyond the building of the infrastructure mentioned above, interventions may be required to remove material from the gulley walls to reduce the gradient to a stable 1:2 slope. This activity will not need a BA if a maintenance management plan is compiled; this still requires approval by the competent authority.
GN R983: Activity 27	The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation, except where such clearance of indigenous vegetation is required for – (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan. (If more than 20 ha then activity 15 of GN R325 applies)	In order to shape the gully appropriately, and construct the hard interventions like gabions, some indigenous vegetation may need to be cleared. This activity will not need a BA if a maintenance management plan is compiled; this still requires approval by the competent authority.

GN R327: Activity 48	The expansion of – (i) infrastructure or structures where the physical footprint is expanded by 100 m^2 or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 m^2 or more; Where such expansion occurs – (a) within a watercourse; (c) if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse	The proposed rehabilitation interventions include interventions such as stone check dams, gabions, or gully reshaping, etc. which may lead to the expansion of structures by 100 m^2 either individually or cumulatively within the system. Furthermore, these will be constructed within the gully channel, which is considered a watercourse.
Listing Notice 2, GN R325		
GN R325: Activity 24	The extraction or removal of peat or peat soils, including the disturbance of vegetation or soils in anticipation of the extraction or removal of peat or peat soils, but excluding where such extraction is for the rehabilitation of wetlands in accordance with a maintenance management plan.	This activity will not need a BA if a maintenance management plan is compiled; this still requires approval by the competent authority.
Listing Notice 3, GN R324		
GN R324: Activity 12	The clearance of an area of 300 m^2 or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (a) In Eastern Cape… (i) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; (ii) within critical biodiversity areas identified in bioregional plans; (iv) on land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.	In order to shape the gully appropriately, and construct the hard interventions like gabions, some indigenous vegetation may need to be cleared. This activity will not need a BA if a maintenance management plan is compiled; this still requires approval by the competent authority.
GN R324: Activity 14	The development of –	The proposed rehabilitation interventions include interventions such as stone check dams, gabions,

	(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 m^2; or (ii) infrastructure or structures with a physical footprint of 10 m^2 or more; where such development occurs – (a) within a watercourse; (c) if no development setback has been adopted, within 32 m of a watercourse, measured from the edge of a watercourse; (c) In Eastern Cape: (ii) Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an International Convention; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Core areas in biosphere reserves; (hh) Areas within 10 km from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or (ii) Areas seawards of the development setback line or within 1 km from the high-water mark of the sea if no such development setback line is determined	etc. which may exceed 10 m^2 either individually or cumulatively within the system. Furthermore, these will be constructed within the gully channel, which is considered a watercourse. Declared Mountain Catchment Areas are listed protected areas in terms of the NEMPAA
GN R324: Activity 23	The expansion of – (i) dams or weirs where the dam or weir is expanded by 10 m^2 or more; or	The proposed rehabilitation interventions include interventions such as stone check dams, gabions,

	(ii) infrastructure or structures where the physical footprint I expanded by 10 m^2 or more; where such expansion occurs – (a) within a watercourse; (c) if no development setback has been adopted, within 32 m of a watercourse, measured from the edge of a watercourse; (b) In Eastern Cape: (ii) Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 km from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (hh) Areas seawards of the development setback line or within 1 km from the high-water mark of the sea if no such development setback line is determined.	gully reshaping, etc. which may exceed 10 m^2 either individually or cumulatively within the system. Furthermore, these will be constructed within the gully channel, which is considered a watercourse. Previously declared Mountain Catchment Areas are listed as protected areas in terms of the NEMPAA.